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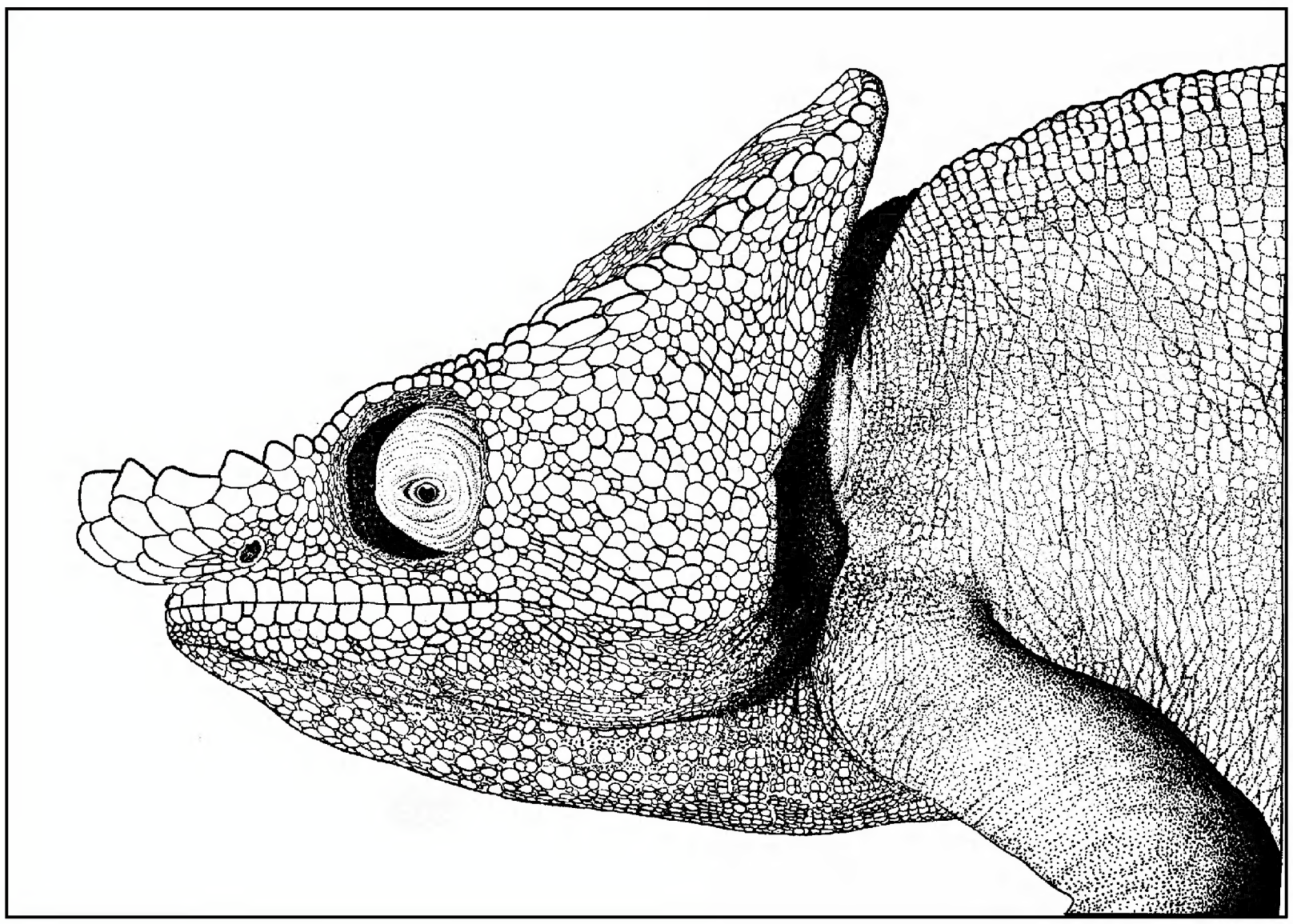

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Additional Reptiles and Amphibians Introduced to the Bahamas: A Growing Conservation Concern

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The number of exotic species of reptiles and amphibians introduced to the Bahamas continues to grow. Here I review the documented introductions and report four additional species, at least one of which appears to have become established.

Currently there are ten species of reptiles and amphibians known to be introduced and assumed to be established to the Bahamian archipelago, and several additional species that are not known to be established but have been reported from the country. Established species are the red-eared slider, *Trachemys scripta elegans* (Grand Bahama); two house geckos *Hemidactylus garnotii* (New Providence, Exumas, and Turks and Caicos) and *H. mabouia* (Abaco and New Providence); a dwarf gecko, *Sphaerodactylus copei* (New Providence and Andros); corn snake, *Elaphe guttata* (Grand Bahama); rat snake, *E. obsoleta* (Abaco); squirrel treefrog, *Hyla squirella* (Grand Bahama and North Bimini); pig frog, *Rana grylio* (New Providence and Andros); southern leopard frog, *Rana sphenocephala* (Grand Bahama); and eastern narrow-mouthed toad, *Gastrophryne carolinensis* (Grand Bahama). Documented as occurring in the Bahamas, but probably not yet established are the eastern ribbonsnake, *Thamnophis sauritus* (New Providence), and common gartersnake, *Thamnophis sirtalis* (Abaco). Most of the introductions are of south Florida origin. The single exception is *Sphaerodactylus copei cataplexis*, which is native to Hispaniola. The house geckos were apparently secondary introductions derived from introduced Florida populations. Furthermore, a number of native species have been translocated between islands (*Cyclura*, *Leiocephalus*, *Trachemys*), and Lee and Ross (2001) discussed the origin of the Cat Island turtle (*Trachemys terrapen*). It is unclear whether the Bahamian populations of these turtles are native or a transplant from Jamaica.

Additionally, Carey (2002) reported on an American alligator, *Alligator mississippiensis*, removed from Great Harbor Cay. The animal was first spotted in a golf course pond in April 1995 and was captured and removed in October 2002. Residents of the island thought there was more than one animal but the biologists who removed it were unable to locate additional alligators. There is no indication of a reproducing alligator population. Also, on New Providence Seidel and Adkins (1987) conducted biochemical studies of freshwater turtles from that island and showed the population to be a genetic swarm of the two translocated species native to the Bahamas as well as *Trachemys decorata* from Hispaniola. Thus, the Hispaniolian slider was at one time introduced to the Bahamas, and in 1997 I examined and photographed a Cuban slider, *Trachemys decussata*, that had been illegally brought to New Providence and was confiscated by the Department of Agriculture. It was kept as a pet by one of the staff and later escaped.

New Introductions

Between 1998 and 2002 a number of adult and subadult brownsnakes, *Storeria dekayi*, were brought to and collected by the staff of the Rand Nature Center on Grand Bahama. At least one was gravid and produced young within a few weeks after capture. In September 1988 I personally examined two adult specimens, which had been captured within the previous month. One was 11¼ in (286 mm) and the other was 12¼ in (312 mm) in total length. The two specimens I saw were both Florida brown snakes, *S. d. victa*. This subspecific identification was based on markings and scale counts (15 scale rows) consistent with this taxon. The pine–palmetto forest of Grand Bahama is very similar to habitats in south Florida where these snakes occur and it is likely that this species is already established on this island.

Adult Florida box turtles, *Terrapene carolina bauri*, have been recovered repeatedly on Grand Bahama and brought to the Rand Nature Center. These turtles were assumed to have been pets on yachts and later released. While there is presently no indication of reproduction, box turtles are very long lived and the open pine woods of Grand Bahama and several other large islands in the northern Bahamas provides habitat similar to the pine–palmetto flatwoods where these turtles occur in south Florida.

The first mention of introduced *Trachemys* in the Bahamas is in a birder's guide (White, 1998). A feral population of what was regarded as red-eared sliders (*Trachemys scripta elegans*) is reported at the Rand Nature Center on Grand Bahama. These turtles, released as unwanted pets, have been present at the single pond, based on photographs at the center, since at least the early 1970s. I would estimate the population at 75 to 100 adult and subadult turtles. Many of the adults are melanistic. Adults were observed laying eggs in April 1997, and interestingly the eggs of all the nests I located were consumed by raccoons, *Procyon lotor*, a species introduced on the island in the 1930s. I measured one particularly large female *Trachemys*, which had a carapace length of 12 in (305 mm) and there were others in the pond of equal or slightly larger size. The maximum recorded size for *elegans* is 11 inches, and this particular turtle was larger than any individuals of the *scripta* complex. It was later determined from photographs that this individual was probably a hybrid with parent stocks of one or more of the central American species. I suspect that typical *elegans* also occur in this pond but many, perhaps most, appeared to look like the Central American specimen I photographed and the males were so melenistic that there were not many distinctive features.

Mealey et al. (2001) report on six adult *Trachemys* they collected from South Bimini. The turtles were not positively

identified to species but the authors suspected they were *T. s. elegans*. Photographs accompanying the text show turtles that are similar in appearance to the Central American *Trachemys* I observed at the Rand Nature Center. It may be that prior to the close of the mass red-eared slider trade in the U.S. that pet shops in the Bahamas were obtaining turtles bred from stocks in Central America. At some sites populations of these turtles or hybrids with *T. s. elegans* and/or indigenous Bahamian *Trachemys* are occurring while at the newer ponds, such as those on the golf course on Grand Bahama, populations (see below) are derived from the currently imported U.S. *elegans*.

In 1999 I found large populations of what appeared to be typical *elegans* in several ponds on a private golf course on Grand Bahama. While sales of hatchling turtles are theoretically banned in the United States, large numbers are exported from the U.S. to other countries for the pet trade. Several pet shops in Nassau sell hatchling red-eared sliders and they are probably sold on the other developed islands as well. At issue is the fact that the Bahamas has two indigenous taxa of *Trachemys* which will freely interbreed with *scripta*. Both of the endemic sliders face a number of conservation issues and with the continued importation of red-eared sliders as pets, and inter-island transport of these turtles by people from out islands, genetic swamping of the native stocks is a strong reality. The government needs to take measures to prevent additional import and to make the public aware of the issue. The movement of sliders from island to island has already become a problem throughout the Bahamas. Visitors to various outer islands often bring home cultural, geological or biological elements believed to be unique to particular islands as souvenirs. This led to hybridization of *Trachemys* on New Providence (Seidel and Adkins, 1987). Biochemical analysis of turtles from that island showed the population to be a genetic swarm of the two translocated species native to the Bahamas as well as *T. decorata* from Hispaniola. A number of locality records for *Trachemys* on other islands which appear to represent naturally occurring populations of "native species" are actually stocks of questionable geographic and genetic origin (Lee and Carey, 2001). The Bahamian Department of Agriculture was made aware of the threat that red-eared sliders present to the endemic species as early as 1999, but to date no regulations regarding import or educational initiatives have been undertaken.

Late one afternoon in mid-March of 2001 I heard a single vocalizing male green frog, *Rana clamitans*, calling from the edge of a small golf course pond near Freeport, Grand Bahama. This is they only known report of this species from the Bahamas. Red-eared sliders were established in this same manmade pond and it is assumed that the frog was one imported and released by a tourist. It is not know if this individual represented part of an established population. No other individuals were heard but this date was early in the breeding season so the presence of other frogs cannot be ruled out. A nearby recently developed tourist garden had imported a number of terrestrial and aquatic plants for their gardens so this is also a possible source of translocation for the species.

Nearly all the introductions appear to be accidental rather than deliberate releases. The exceptions are the alligator, turtles, and the pig frog. Pig frogs were deliberately imported and established as a possible food item (Franz et al., 1996); the turtles were abandoned pets. At this time alien species make up a minimum of 25% of the total herpetological fauna of the Bahamian archipelago (excluding marine turtles, 14 of 58 species). This is on a archipelago of over 33 major islands, 670 smaller islands, and about 2,400 named cays, islets and rocks. The archipelago spans an area in the western Atlantic from 20°55′ to 27°30′ N Latitude and from 71°10′ to 79°20′ W Longitude. The inter-island movement of various native species is also a major issue, but one harder to track. Translocations of species and subspecies to islands where they are not indigenous is perhaps a bigger problem than the introduction of exotics from outside the country. The zoogeography of the archipelago is complex and different banks of islands each have documented zoogeographic affinities with specific West Indian islands. Species and subspecies are not distributed willy-nilly and indigenous faunas are compromised by the currently unregulated inter-island movement of reptiles and amphibians by man. In addition to enactment and enforcement of wildlife regulations a strong education program is needed for both Bahamians and government officials as well as for visiting tourists.

Most of the introduced fauna is believed to have been accidentally brought in with landscaping plants from south Florida. This concept is reinforced by the fact that nearly all the North American transplants, where subspecies can be determined, are of Floridian origin. Large mature plants with large root balls are shipped from nurseries in Florida for newly developed tourist facilities, golf courses and residential communities. Reptiles and amphibians living at the base of these plants are occasionally transported with the plants. This is a major business and many thousands of large mature plants are brought in to the Bahamas annually. Lee (1969) reported a wide array of reptiles and amphibians finding shelter at the base of the dead fronds on the trunks of cabbage palms (*Sabal palmetto*) in central and south Florida. These palms are commonly imported as landscaping plants in the Bahamas because of the relative ease of excavating, transport and establishment of large, mature plants. Sixteen reptile and amphibian species were encountered living in Florida cabbage palms, including at least four of the species which have been introduced to the Bahamas (*Elaphe guttata*, *E. obsoleta*, *Gastrophryne carolinensis* and *Hyla squirella*). In several cases the overlapping dead fronds were used as incubation sites for eggs of lizards and snakes. Additionally, some of the landscaping plants themselves have actually become invasive exotics, both in south Florida and in the Bahamas (Hammerton, 2002) and are in turn invading and disrupting native plant communities. While Section 4(c) of the Agriculture and Fisheries Act (Chapter 223) of 1963 empowers the Minister of Agriculture "to uproot or destroy any specific kind of plant" no actions have ever been taken under this Section. Because of the mode of transport it is not surprising that most of the introduced herpetological fauna of the Bahamas occurs on the larger developed tourist islands with major ports and where landscaping is done on a massive scale.

This problem is not unique to the Bahamas. Seidel and Franz (1994) reviewed the herpetofauna of the Cayman Islands. Excluding marine turtles and peripheral records of American crocodiles, of the twenty-four species known from the country, one is extirpated, and eight are introduced exotics. Thus, 35% of the extant reptile and amphibian fauna is exotic. They also report six translocations of species between islands in the country, and also comment on the problem of exotic species being introduced from the southeastern United States via importation of landscaping plants. Many of the same exotic species established in the Bahamas also occur in the Caymans, and similar issues of endemic taxa being compromised by translocations exist.

Considering the favorable climate of the country, the number of exotic reptiles and amphibians now established in south Florida, and with no indication that the Bahamian Department of Agriculture is about to impose restrictions on the import of established nursery stock as a conservation action, it seems inevitable that the number of exotic reptiles and amphibians will only increase, and once established within the country many will be translocated to other islands. In fact it is quite likely that a number of additional species have already become established in the Bahamas or Turks and Caicos. Secretive, nocturnal, and burrowing species would be hard to detect, and many genera shared by these countries (e.g., *Anolis*, various geckos) would be hard to recognize to the species level with only casual examination. To date there have been no systematic herpetological surveys of the developed areas where alien species would most likely gain their initial foothold. The Bahamas support a rich native herpetofauna with a number of endemic species and many endemic insular subspecies. Swamping of the native fauna with an endless inoculations of exotics can not be something viewed as desirable. The IUCN considers alien invasive species a significant threat, especially to island faunas. Many people in tune with the conservation needs of reptiles and amphibians see introductions only as additional distributional information for maps or regional checklist and fail to consider their potential for impacting native faunas. Furthermore, changes in the vegetative community resulting from the invasive alien plants originally imported for landscaping will only enhance the likelihood that exotic weed species of herpetofauna will have competitive advantage over the indigenous fauna.

Acknowledgments

I thank Rick and Cathy Oliver, formerly of the Rand Nature Center, for accompanying me during some of my travels in the Bahamas and for first making me aware of some of the species discussed. Dennis Uhrig provided information on the identification of the central American *Trachemys* based on photographs in the Tortoise Reserve's collection.

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Selected Records of 2003 Lizards from Chihuahua and Sonora, Mexico

Julio A. Lemos-Espinal[1], David Chiszar[2], Hobart M. Smith[2] and Guillermo Woolrich-Piña[1]

Abstract

The accounts for 28 species of lizards, mostly from Chihuahua, involve most notably: color pattern variants and/or ontogeny in *Anolis nebulosus, Aspidoscelis costata barrancarum* and *Ctenosaura macrolopha*; a range extension for *Aspidoscelis sonorae* and *Crotaphytus nebrius* in Sonora; fourth locality for *Coleonyx brevis* in Chihuahua; range extension for *Elgaria k. kingii* in Chihuahua; low altitude records for *Elgaria k. kingii* and *Eumeces brevirostris bilineatus*; second locality and third known specimen of *Gerrhonotus taylori*; recognition of a *Holbrookia elegans* group containing *H. elegans* and *H. approximans*; species rank assigned to *Sceloporus albiventris*; comparison of *Sceloporus c. clarkii* in Chihuahua with the extralimital *S. c. boulengeri*; description of male *Sceloporus lemosespinali*; and the first record of *Urosaurus ornatus* west of the Continental Divide in central western Chihuahua.

We here report on some of the lizards collected in Chihuahua and western Sonora by JLE in 2003. All are in the collection of the Laboratorio de Ecología, Unidad de Biología, Tecnología y Prototipos (UBIPRO), Facultad de Estudios Superiores, Escuela Nacional de Estudios Profesionales, UNAM, of Tlalnepantla, Estado de México, to which catalog numbers refer. Most specimens are from the western part of Chihuahua.

Anolis nebulosus Wiegmann. 11304, Rancho Jovinos (27°21′3.5″N, 109°30′10.8″W), 428 m; 11305-7, Arroyo Las Borregas (27°23′4.3″N, 108°32′21.1″W), 470 m; 11364, Temoris (27°17′19.8″N, 108°17′19.0″W), 1464 m; Rancho El Jordán (27°23′16.8″N, 108°32′39.6″W), 469 m; 11782, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m.

Three females and four males are represented. One female (11305) has a bright yellowish, dark-edged vertebral stripe, maximally 11–12 scales wide (at rump), extending from nape to tip of tail. One male (11782) is exceptional in having a bright, dark brown reticulate pattern on a light, grayish-brown ground color on sides of neck and abdomen. Four narrow, V-shaped dark marks on trunk connect with the lateral reticulation. All others show very faint evidence of the reticulate/banded pattern.

The middorsal scales are slightly larger and less prominently keeled in females than in males.

Aspidoscelis costata barrancarum (Zweifel). 11334-6, Arroyo Las Borregas (27°23′4.3″N, 108°32′21.1″W), 470 m; 11365-6, Los Llanos (27°20′18.1″N, 108°19′27.2″W), 1272 m; 11392-6, Ejido Gorojaki (27°25′35.8″N, 108°33′18.0″W), 450 m; 11475-82, 11503-6, 11508-10, 11528-33, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m.

Los Llanos is at an exceptionally high altitude for the species.

Except for 11477, a male 111 mm SVL, the largest of this series, no clearly defined light spots are present on the dorsum. They are diffuse and only vaguely discernible in some medium-sized individuals, absent in the young and adults. The young have bright, contrasting stripes and no spots; the stripes are clearly evident but less contrasty up to at most about 100 mm SVL. Most adults have very faint stripes at least on part of the body, and spots not or barely discernible.

The exceptional male, 11477, has well-developed, although not contrasty, light stripes and spots, widely different from the other adults. It closely resembles the holotype of *A. c. barrancarum* (Zweifel, 1959: pl. 45) from nearby Guirocoba, Sonora. Although his diagnosis indicates that adults of the subspecies may lack evidence of the juvenile pattern except for faint traces of the stripes, his westernmost material from Guirocoba may "prove to be atypical of the subspecies as a whole (op. cit.: 105). The rest of his material was from Chihuahua (Gua-

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saremos and 12 mi. W Cuiteco). He also noted (loc. cit.) that "It is highly possible that the lizards of Guirocoba represent a population intermediate in pattern characters between *C. sackii griseocephalus* of a more coastwise distribution and a striped, unspotted form of the barranca region." He nevertheless stated that "there is no question of the distinctness of the population at Guirocoba from *griseocephalus*."

The present material suggests that *A. c. barrancarum* is variable in pattern, inasmuch as a lined and spotted pattern occurs in the barranca region, accompanied by almost unicolor adults. Intergradation of *griseocephala* and *barrancarum* seems unlikely since Zweifel regarded their closest relatives to be separate subspecies farther south, not with each other.

Aspidoscelis exsanguis (Lowe). 11560, Puerto de La Valdeza, Sonora (30°38′21.6″N, 109°46′9.1″W), 1506 m; 11569, km 52, Agua Prieta/Cananea, Sonora (31°7′14.5″N, 110°1′11.5″W), 1490 m; 11579, Microondas Puerto San Luis (31°19′30.7″N, 108°45′20.8″W), 2074 m.

All of these three adults, 74–81 mm SVL, have the characteristic color pattern of this species, with quite small light spots scattered on the dark ground color and also on or in contact with the light stripes. The localities fall within the known range of the species.

Aspidoscelis sonorae (Lowe and Wright). 11617, 11707-8, Güisamopa, Sonora (28°39′1.9″N, 109°6′57.1″W), 860 m.

These specimens are quite small, 31–49 mm SVL, taken 24 September. The hatchling and one 45 mm SVL have no light spots; they are present but dim at 49 mm SVL, and confined to the dark spaces between the light lines. The light spots appear to form at a much smaller size than in *A. c. barrancarum*, at about 80 mm SVL.

The known range of this species is extended by this series about 150 km southward in the eastern part of the state.

Coleonyx brevis Stejneger. 11612, Ejido Arenales, mpio Jiménez (26°59′46.9″N, 103°49′20.8″W), 1165 m; 11718, 11931-5, betw Escalón and Carrillo (26°43′27.0″N, 104°18′29.1″W), 1100 m.

These seven adults are from localities near the extreme southeastern corner of the state, near the western known range limits of the species. It is known from only four localities in Chihuahua (Lemos-Espinal, Smith and Chiszar, 2000, 2001).

Cophosaurus texanus scitulus (Peters). 11852-3, Llano de Flores Magón (30°0′29.9″N, 107°15′11.6″W), 1500 m.

The male and female are typical, and from the central western part of the known range of the subspecies.

Crotaphytus nebrius Axtell and Montanucci. 11835-6, Güisamopa, Sonora (28°39′1.9″N, 109°6′57.1″W), 860 m.

These are juveniles, 46–54 mm SVL, with little evidence of a reticulate pattern on the sides of the head. Both have dark bands on dorsum, brighter in the smaller. The interspaces are narrow in the larger, but a little less wide than the dark bands in the smaller. The characteristic whitish spots are scarcely evident in the smaller, better developed in the larger.

The locality extends the known range of the species eastward from its southern limit to within 35 km of Chihuahua.

Ctenosaura macrolopha Smith. 11483-4, 11511-3, 11834, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m; 11535, El Limón (27°24′12.0″N, 108°32′36.0″W), 451 m.

The specimens 50–51 mm SVL are uniform gray in preservative. At 95–120 mm SVL, the bands on body and tail are sharply distinct. At 123 mm SVL, the anterior two bands on body, and those on tail, are sharply distinct; the more posterior bands on body are distinctly less well defined. At 135 mm SVL, the posterior bands on body, and those on tail, are faint. In the largest, at 170 mm SVL, only the anterior two bands on body are distinguishable. There are 8 bands on body in all, where visible.

Elgaria kingii kingii Gray. 11540, La Lobera (27°16′12.9″N, 108°37′25.5″W), 1100 m; 11839, Mojárachi (27°51′46.4″N, 107°55′47.0″W), 2211 m.

No. 11540 is from an exceptionally low altitude, and from near the southern limit of the range of the subspecies. It nevertheless shows no evidence of the pattern of the more southerly *E. k. ferruginea*. It has been reported before from Mojárachi (Lemos-Espinal et al., 2004).

Eumeces brevirostris bilineatus Tanner. 1184-6, Milpillas (27°11′29.2″N, 108°38′38.2″W), 1250 m.

All have a single postmental, 22 midbody scale rows, a short medial postgenial, interparietal not enclosed, and the light stripe confined to the 3rd scale row throughout its length.

The altitude at which these were taken is exceptionally low, and close enough to the Sonora border to suggest that the species may occur in that state (Robinson, 1979).

Eumeces callicephalus Bocourt. 11702, Ejido Gorojaki (27°25′35.8″N, 108°33′18.0″W), 450 m.

The median light line bifurcates on the nuchals. The locality falls well within the known range of the species (Lieb, 1985).

Gerrhonotus taylori Tihen. 11453, km 13 Puerto Justo-Balleza (26°51′35.9″N, 106°7′9.2″W), 2040 m.

This is the third specimen of *Gerrhonotus* known from Chihuahua. Tihen (1954) described as new *G. liocephalus taylori*, based on two specimens from Clarines mine, 5 mi W Santa Bárbara, 6800 ft. We refer our specimen to the same taxon, at species rank. It extends the known range of the species about 40 km NW of the type locality. As close as these localities are to Durango, it is probable that the species occurs in that state.

This is a DOR adult 120 mm SVL, with head, body and rump somewhat crushed, the tail missing, and the hind legs partially severed. Nevertheless the significant essentials of scalation are evident: ~52 transverse and 18 longitudinal dorsal scale rows; ~59 transverse and 14 longitudinal ventral scale rows; anterior internasals and one postrostral behind rostral, followed by a pair of supranasals, and then a pair of

posterior internasals; apparently 11-12 supralabials, 10-12 infralabials; other head scales normal.

The dorsal pattern is much like that of the type (Tihen, 1954) except that the light bands between the dark ones are narrower, essentially one scale length. The venter is lightly dark-flecked.

The specimen conforms with the diagnostic features of the taxon. It is possible that all of the isolated reports of *Gerrhonotus* from western Mexico (Goode, 1988) represent *G. taylori*. All are widely isolated from *G. liocephalus* farther east. Its distribution suggests relictual status.

Holbrookia approximans Baird. 11363, 11663, 11848, near Bahuichivio (27°21′57.7″N, 108°9′7.9″W), 1519 m; 11555-6, Cañon del Oso, Sierra de San Luis (31°16′17.7″N, 108°43′7.0″W), 1661 m.

This species is a relatively high-altitude representative, mostly east of the Continental Divide, of the *H. elegans* complex that is unique in having the lateral abdominal bars blue-enclosed and black in males, greatly reduced or even absent and grayish or brownish in females. *H. elegans* is limited to the lowlands west of the Continental Divide in Sonora, Chihuahua and Sinaloa.

Records of *H. elegans* (or *H. pulchra*) from southeastern Arizona and southwestern New Mexico actually pertain to the high-altitude *H. approximans* (Lemos-Espinal et al., 2002, 2004).

All of the many specimens from Chihuahua cited by Tanner (1987) as *H. maculata approximans* (then interpreted conventionally as a wide-ranging subspecies of southwestern U.S.A., not the largely Mexican *H. approximans* as now understood) are obviously *H. approximans* except for the specimens from El Kilo and 30 km S Cd. Juárez (*H. maculata bunkeri*), where the species does not occur.

Holbrookia elegans thermophila Barbour. 11292-303, banks of Río Chínipas, at Rancho Jovinos (27°21′3.5″N, 108°30′10.8″W), 428 m; Vado de Cuba (27°25′1.6″N, 108°32′48.8″W), 430 m; 11382, Gorojaki (27°25′35.8″N, 108°33′18.0″W), 450 m; 11397-8, Vado de los Amoles (27°26′51.8″N, 108°32′29.2″W), 455 m; 11534, 11717, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m; 11615-6, 11847, Güisamopa, Sonora (28°39′1.9″N, 109°6′57.1″W), 860 m.

We regard this subspecies as different from *H. e. elegans* most obviously in its greater tail/SVL ratio, 1.0 or more (vs less than 1.0), and in the absence of a posteromedial gular pink or orange spot in males, and its only occasional presence in females (vs regular presence in both sexes). These characters were not considered by Hardy and McDiarmid (1969), who did not recognize subspecies of this species. The relative ranges of the two subspecies remain to be determined, but records of *H. elegans* (or *H. pulchra*) from southeastern Arizona and southwestern New Mexico pertain to *H. approximans*.

Phrynosoma cornutum (Harlan). 11610, betw Escalón and Carrillo (26°43′47.0″N, 104°18′29.1″W), 1100 m; 11714, km 2 El Morrión-Ojinaga (29°8′35.3″N, 105°25′8.7″W), 1452 m; 11850-1, Llano de Flores Magón (30°0′29.9″N, 107°15′11.6″W), 1500 m.

A hatchling 26 mm SVL has the typical markings and body scalation of the species, but the proportional size of the cranial horns is much different from that of adults. The length of the occipital horns is half of the distance between them, and their length is little greater than their width. The ontogenetic change in horn size is considerably greater than in any other species of *Phrynosoma* in Chihuahua.

Phrynosoma modestum Girard. 11668, 11837, km 2 El Morrión-Ojinaga (29°8′35.3″N, 105°25′8.7″W), 1452 m.

Phrynosoma orbiculare bradti Horowitz. 11455, Mesa Agostadero (26°54′38.7″N, 106°47′14.1″W), 2356 m; 11842, 4 km N Guachochi (26°57′44.6″N, 107°8′50.3″W), 2509 m.

Two large adults have a single row of lateral abdominal spines, and the width between the occipital horns is less than their length.

Phyllodactylus tuberculosus saxatilis Dixon. 11845-6, 11869, Capilla Mesa El Rosario, Chínipas (27°22′48.0″N, 108°32′41.1″W), 469 m.

Two of these specimens (11845-6) agree in pattern with the six specimens from the same general area reported by Lemos-Espinal, Smith and Chiszar (2001). A middorsal, unpigmented area ~3–12 scales wide extends from rear of head to rump, bordered on each side by a series of dark brown, subrectangular blotches, 6 between axillary and rump levels; the sides of the abdomen and neck, as well as the top of the head, are reticulated. This pattern may be largely limited to southwestern Chihuahua.

The pattern of the third specimen is much different. Nine narrow dark bands extend from near the midline to low on the sides, although much dimmer in a broad middorsal area. The bands are separated from each other by a narrow light line one tubercle in width. These markings are not sharply defined on head, tail or body, unlike the other two.

No yellow is visible on the sides of the abdomen in any of this series.

Sceloporus albiventris Smith. 11331, Rancho Jovinos (27°21′3.5″N, 108°30′10.8″W), 428 m; 11332-3, El Limón (27°24′1.8″N, 108°32′36.0″W), 451 m; 11485-7, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m.

The three males are completely devoid of dark ventral markings, as are the females. However, the largest male, 92 mm SVL, has a faint bluish cast at the sides of the abdomen; the other two, at 67–68 mm SVL, lack that color. The largest female is 92 mm SVL.

The fourth supraocular is in contact with the frontoparietal in all. The femoral pores are 2–4 (2, two; 3, eight; 4, two). They are the same in number on both legs, and are about as well developed in females as in males.

All records of this taxon are north of 20°N, west of the Sierra Madre Occidental at low altitudes; all *S. h. oligoporus*

records north of 20°N are from east of the Sierra, and occur on the plateau at higher elevation. Given the dichopatry of the two taxa, the absence of any indication of intergradation between them, and the sharp difference of ventral coloration in males, *S. albiventris* should be regarded as a species.

Sceloporus clarkii clarkii Baird and Girard. 11328-30, 11400, Arroyo Las Borregas (27°23′4.3″N, 108°32′21.1″W), 470 m; 11389-91, 11514, Ejido Gorojaki (27°25′35.8″N, 109°33′18.0″W), 450 m; 11562, Puerto de La Valdeza, Sonora (30°38′21.6″N, 109°46′9.1″W), 1506 m; 11618, Güisamopa, Sonora (28°39′1.9″N, 109°6′57.1″W), 860 m; 11709-10, Sta. María, Moris (28°12′20.9″N, 108°31′36.7″W), 794 m; 11719, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m; 11849, Moris (28°8′51.6″N, 108°31′21.8″W), 772 m.

The dorsals are 26–34 ($\bar{x}$ = 30, N = 14); unilateral femoral pores, 10–14 ($\bar{x}$ = 12.3, N = 25); total femoral pores, 23–28 ($\bar{x}$ = 24.8, N = 12).

The dorsals mean is nearer that of *S. c. boulengeri* (29.8) than that of *S. c. clarkii* (31.8; Smith, 1939), but that difference is not diagnostic, although statistically significant.

However, the unilateral femoral pore mean is the same as that of *S. c. clarkii*; in *S. c. boulengeri* it is 9.1 (Smith, 1939). The mean total femoral pore count, as expected, is also nearer that of *S. c. clarkii* (24.6; Smith, 1939) than that of *S. c. boulengeri* (18.6 Hardy and McDiarmid, 1969; 18.2 Smith, 1939). The pattern of the present series likewise conforms with that of *S. c. clarkii* (no dorsolateral light lines), and differs from that of *S. c. boulengeri* (lines present).

Therefore we conclude that the present series and others from the same general area are properly regarded as *S. c. clarkii*, as concluded by Lemos-Espinal, Chiszar and Smith (2001). Apparently the area of intergradation lies in northern Sinaloa, but is yet to be determined.

Sceloporus jarrovii Cope. 11344-5, km 48, Creel-San Rafael (27°31′15.6″N, 107°50′48.7″W), 2191 m; 11597-8, Arenopanuchi (27°30′27.1″N, 107°50′36.2″W), 2222 m; 11637, San Rafael-Maguarichi (28°9′23.6″N, 108°7′15.4″W), 2294 m.

None of these have the black nuchal collar extended posteriorly—a variant not occurring in U.S. material, but of common occurrence in parts of Chihuahua and Durango.

Sceloporus lemosespinali Lara-Góngora. 11458, Mesa Agostadero (26°54′38.7″N, 106°47′14.1″W), 2356 m; 11596, Valle de los Pinos, 9 km S Creel (27°41′43.5″N, 105°35′8.1″W), 2386 m; 11854, San Rafael (27°29′51.6″N, 107°53′29.1″W), 2150 m.

No. 11596, 49 mm SVL, is a beautiful adult male with a complete, black ventral collar preceded by a large, bright blue gular center surrounded except posteriorly by narrow, radial light streaks on a solid gray background; abdominal semeions with broad (mostly 5 scale widths) median black borders separated from each other by one scale width anteriorly, ending posteriorly short of groin level (by about 5–6 scale lengths) and anteriorly short of axillary level (by about 5–6 scale lengths); lateral to each black border is an equally long sky blue streak about 3–4 scales wide; lateral to the blue streak is the dark gray, light-flecked lateral surface of abdomen; the dorsal surface has 3 pairs of inverted, U-shaped narrow black lines, each enclosing a distinct light area; a narrow black line extends from each lateral end of the ventral collar posterodorsally, narrowly separated from each other middorsally 6–7 scale lengths posterior to the axillary level. The chest is grayish, with a quite irregular black streak.

The juvenile male (11458, 34 mm SVL) has short midventral black and blue semeions; the ventral black collar is not quite complete; the center of the throat is bluish.

The adult female (11854, 55 mm SVL) is considerably darker than the male; the dorsal pattern is only dimly visible. The entire ventral surface of head and neck is uniformly dark, almost black. There is no evidence whatever of the abdominal semeions, unusual in the *grammicus* group.

Sceloporus nelsoni barrancarum Tanner and Robison. 11308-27, Arroyo Las Borregas (27°23′4.3″N, 108°32′21.1″W), 470 m; 11377-8, 11383-8, Gorojaki (27°25′35.8″N, 108°33′18.0″W), 450 m; 11781, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m.

The 12 adult males, 49–60 mm SVL, all have large, fused abdominal semeions; the entire venter is black. The six adult females are 52–54 mm SVL, all with distinct but separate abdominal semeions. The 11 smaller specimens, 42–48 mm SVL, cannot be sexed with confidence.

Only one of the adult males (11377) has distinctly enlarged postanals.

Sceloporus poinsettii macrolepis Smith and Chrapliwy. 11456, Mesa Agostadero (26°54′38.7″N, 106°47′14.1″W), 2356 m; 11840-1, Mojárachi (27°51′46.4″N, 107°55′47.0″W), 2211 m; 11843-4, Llano de Flores Magón (30°0′29.9″N, 107°15′11.6″W), 1500 m.

All are females, the largest 117 mm SVL. All have the typical cross-banded pattern diagnostic of the subspecies. There are no lateral striae. The dorsals are 30(3)-31(2). Llano de Flores Magón is surprisingly far north for the subspecies, in a semiarid area dominated by xerophytes, whereas Mojárachi and Mesa Agostadero are in oak-pine forest.

Sceloporus slevini Smith. 11342-3, km 48, Creel-San Rafael (27°31′15.6″N, 107°50′48.7″W), 2191 m; 11457, Mesa Agostadero (26°54′38.7″N, 106°47′14.1″W), 2356 m.

All are patterned females with 1-1 canthals. No. 11457 is a large female taken at the southernmost locality known in the central part of the state, near the Durango border. Two small ones, 42–43 mm SVL, were taken 26 April.

Sceloporus virgatus Smith. 11291, 1 km N Cuiteco (27°26′44.2″N, 107°59′38.3″W), 1771 m; 11552-4, Cañon del Oso, Sierra de San Luis (31°13′41.1″N, 108°44′5.5″W), 1638 m; 11570-8, Microondas Puerto San Luis (31°19′30.7″N, 108°45′20.8″W), 2074 m; 11713, Arroyo Seco, km 16.5 La Junta-Guachochi (28°15′45.5″N,

107°29′35.1″W), 2191 m.

The smallest individual (11713), 27 mm SVL, was taken 20 September; one (11291), 38 mm SVL, was taken 21 April. All others are 46–55 mm SVL in males, 52–60 in females. The largest male has small, paired, posterolateral pale blue gular spots, not dark-bordered. Similar but smaller (about 5 scales maximum) and paler gular spots are in the larger females. There appears to be no ontogenetic change in dorsal or lateral pattern.

The sexes are represented disproportionately; only 4 of the 16 are males, and among the 4 smallest ones listed above only one is a male.

Urosaurus bicarinatus tuberculatus (Schmidt). 11337-8, Arroyo Las Borregas (27°23′4.3″N, 108°32′21.1″W), 470 m; 11488, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m; 11703, Cerro Prieto, Chínipas (27°23′39.9″N, 108°32′9.7″W), 469 m.

All but one (11488) have an undivided frontal (a divided frontal is rare in this species); all have a discontinuous latero-vertebral row of enlarged scales on each side; several parietals; 3 gular scales contacting second infralabial; and whorls of larger and smaller caudal scales.

Urosaurus ornatus schottii (Baird). 11542-51, Cañon del Oso, Sierra de San Luis (31°16′17.7″N, 108°43′7.0″W), 1661 m; 11561, Puerto de La Valdeza, Sonora (30°38′21.6″N, 109°46′9.1″W), 1506 m; 11564-8, km 52 Agua Prieta-Cananea, Sonora (31°7′14.5″N, 110°1′11.5″W), 1490 m; 11638, 11711-2, Sta. María, Moris (28°12′20.9″N, 108°31′36.7″W), 794 m.

The series from Sierra de San Luis and northern Sonora agrees with those described by Lemos-Espinal et al. (2004) from the same area, and differs sharply in pattern from the more eastern *U. o. caeruleus*.

The three from Santa María are from low-altitude Pacific slopes about 200 km NNW of the Chínipas area where *U. bicarinatus* occurs. Unfortunately all are hatchlings 22.5–27 mm SVL. Whether these represent the same subspecies as the series from Sierra de San Luis cannot be determined from this sample. On geographic and habitat grounds they could well be different. Even the name here applied to relatively high altitude northwestern Chihuahua/northeastern Sonora material is not assured. Those and adjacent populations have not been adequately studied.

Regardless of subspecific allocation, the Santa María series is definitely representative of *U. ornatus*, not *U. bicarinatus*, because of its symmetrically divided frontal, absence of latero-vertebral rows of enlarged scales, two gular scales in contact with the second infralabial, and other more subjective features.

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Lung Morphology and Its Significance in Riparian Tadpoles

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Abstract

The lung morphology of some riparian tadpoles from Pakistan is described. Ecological correlates of lung morphotype are discussed.

Introduction

In addition to pulmonary respiration, adult anurans respire through the skin and the lining of the buccal cavity, while gills are the main respiratory organs at the tadpole stage. The water current entering the tadpole's mouth carries oxygen as well as food particles. Particulates are sieved at the gill filters and pass into the tadpole's esophagus, while oxygen-rich water passes out through the spiracle, bathing the gill filaments (Khan, 1991, 1999). In adult amphibians lungs are the main respiratory as well as hydrostatic organs.

At developmental Stage 21 of the amphibian tadpole, the gills start developing as gill-buds on the sides of head (Khan, 1965). By Stage 25 the tadpole has four well developed patches of filamentous gills (Figure 1). By Stage 26 the gills are covered by the operculum, becoming internal structures, and are enclosed in the pharyngeal cavity, which opens to the exterior by the spiracle (Khan, 1965). There is an elaborate system of branchial cartilages and associated muscles that helps maintain a continuous flow of water through the buccopharyngeal passage (Gradwell, 1972; Khan, 1991). The buccal floor acts as the "buccal pump," ensuring constant irrigation of the gills.

Most Devonian fishes respired both by gills and lungs, a trait retained by the ancestral crossopterygian lungfishes of the class Dipnoi (Porter, 1972). However, the amphibian tadpole loses its gills at metamorphosis, switching over to lung respiration. The lungs develop as a hollow diverticulum from the post-pharyngeal part of the embryonic gut at the same time that the gill-buds are appearing. The lungs remain connected with the gut through the laryngotracheal duct and the glottal slit. The laryngotrachea bifurcates into two bronchi, which distally swell into lung sacs, the cavities of which are divided into alveoli. The alveoli are profusely supplied with blood capillaries where gas exchange (oxygen / carbon dioxide) takes place.

Amphibians differ in the morphology of their respiratory organs. In caecilians the left lung is much shorter than the right. The size of the lungs and alveoli tend to be greater in pond and terrestrial salamanders than in torrenticole species, where lungs are vestigial. In salamanders of the family Plethodontidae lungs are almost absent. The trachea and bronchi are lacking as a rule in anuran amphibians because of the absence of neck and shortening of the body. Anurans have equally developed right and left lungs with many alveoli. The anuran lungs function as respiratory as well as hydrostatic organs

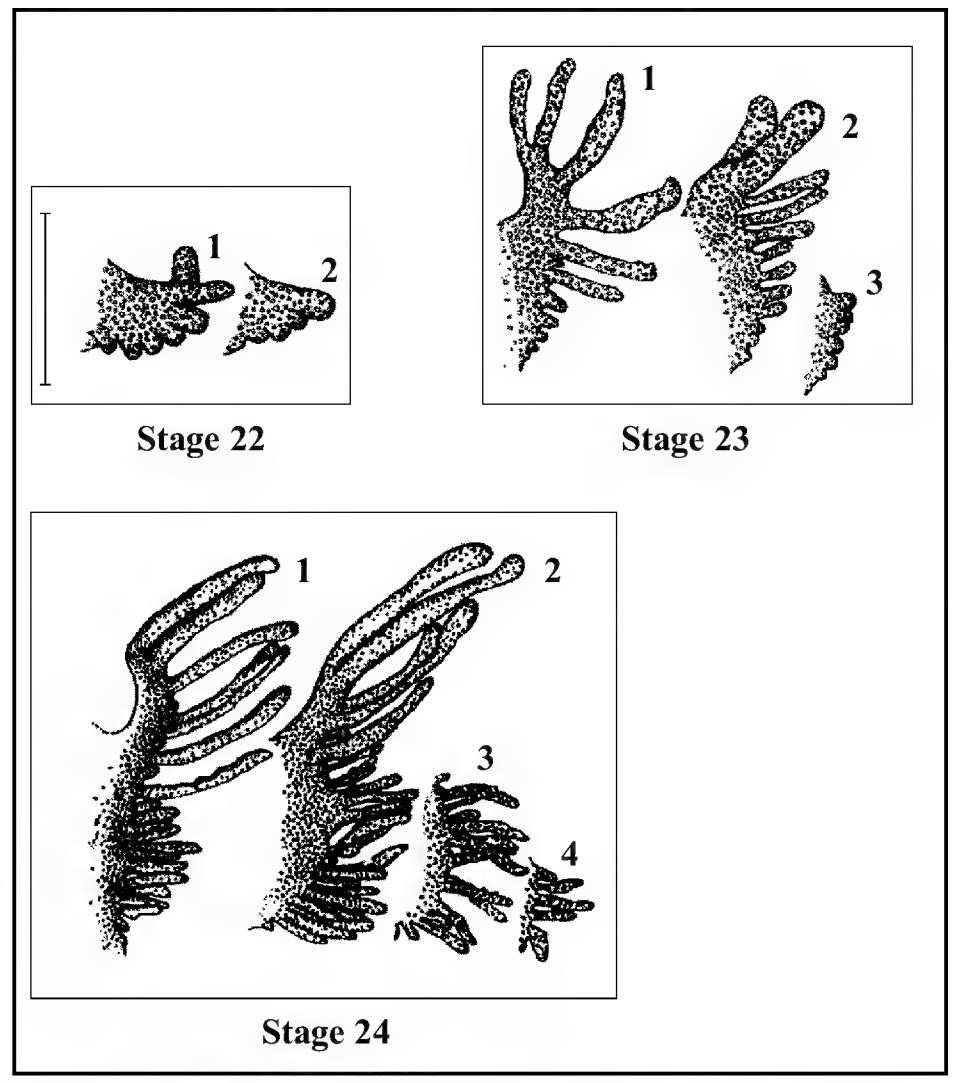

Figure 1. Stages in gill development of the *Bufo stomaticus* tadpole, from developmental Stage 22 though 24 (bar in figure for Stage 22 represents 1 mm).

(Porter, 1972).

I studied the gross morphology of the pulmonary system in different species of riparian tadpoles while I was working on their buccopharyngeal morphology (Khan, 1991). The present paper reports on my findings.

Materials and Methods

Tadpoles used in this study were collected from various localities around Rabwah, Punjab, Pakistan. Normal respiratory behavior of each species of tadpole was studied by maintaining the tadpoles alive in aquaria, where natural conditions for each species were duplicated as closely possible. A few tadpoles of each species were preserved in dilute Bouin's Fluid for surgery to study anatomy of their respiratory system.

Surgery: To expose the respiratory systems, special surgical procedures were devised for each species of tadpole. For convenience Devacker's angular spring iridectomy scissors are preferred over those having straight blades. (Khan, 1991). To

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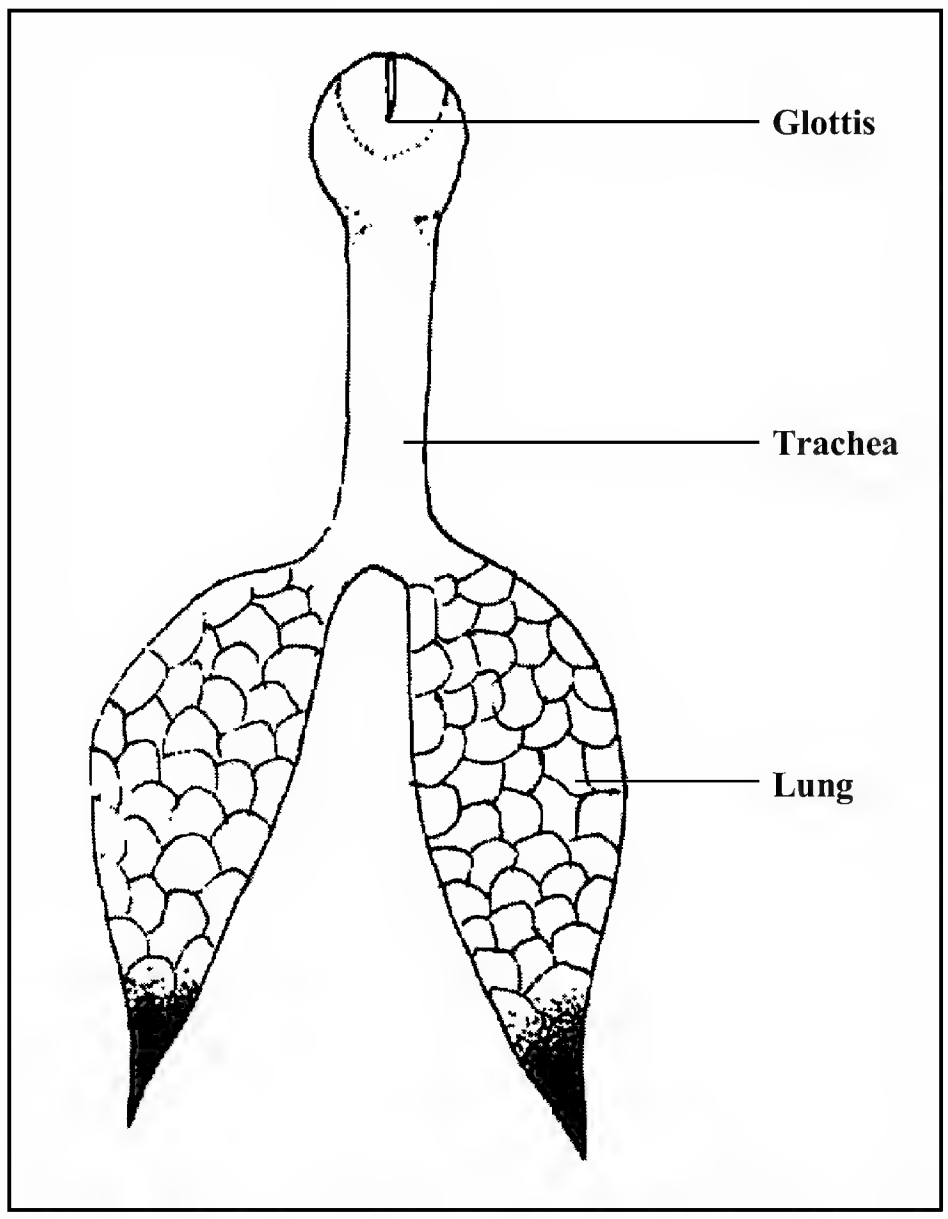

Figure 3. *Microhyla ornata* tadpole: lungs at developmental Stage 35.

begin with, the tadpole is held belly up between the fingers of the left hand by the base of its tail. The tadpole's mouth faces the dissector. The angular blade of the scissors is inserted into one corner of the tadpole's mouth, cutting gently through the ceratohyals of that side until the end of the abdomen, taking care to cut through the body wall but not cutting deep into the body. A similar cut is made on the other side. The third cut joins the first and second cuts at the posterior of the abdomen, freeing the buccopharyngeal floor from its roof.

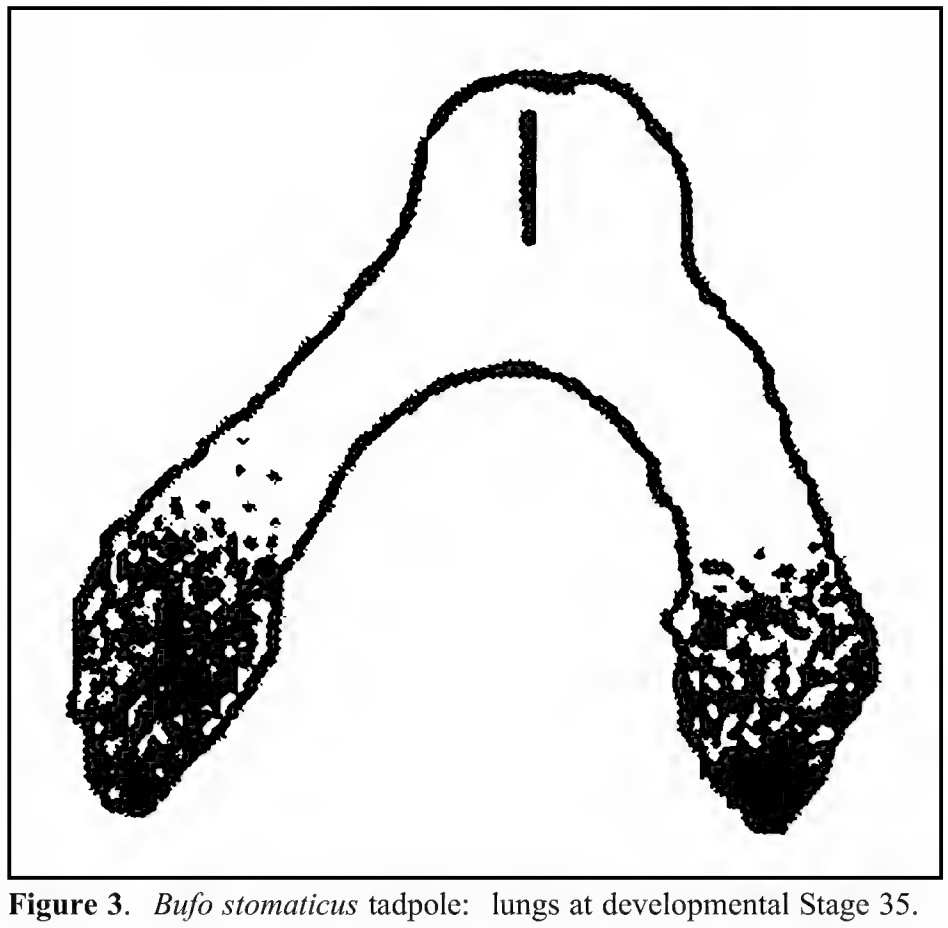

Figure 3. *Bufo stomaticus* tadpole: lungs at developmental Stage 35.

The surgical procedure is modified a bit for each species of tadpole, according to the disposition of the mouth and relevant organs. The mouth in *Microhyla ornata* is anterodorsal; the first and second cuts pass through mid-eye. The upper jaw overbites the lower jaw in the ranoids *Bufo stomaticus*, *Euphlyctis cyanophlyctis*, *Limnonectes syhadrensis* and *L. limnocharis*; the first cut proceeds obliquely dorsoid, smoothly becoming lateral at the level of ceratohyals. In *Hoplobatrachus tigerinus* the mouth is anteriorly disposed; the cuts proceed straight backward through the eye on the sides.

The lungs are dark tipped sacs on each side of the anterior half of the abdominal cavity at the buccopharyngeal floor. Tadpoles' pulmonary respiratory systems follow a typical vertebrate plan: larynx, trachea, bronchi and lungs. Tracing onward from the lungs other parts of the respiratory system can be located (Figure 2).

The following descriptions of the gross morphology of the pulmonary respiratory tract are based on data from five dissected tadpoles of each species at developmental State 35. The drawings were made with the help of a camera lucida.

Lung descriptions of Stage 35 tadpoles (Khan, 1965)

Bufo stomaticus (Figure 3). In this species the pulmonary organs are rudimentary and nonfunctional at this stage. The glottis is imperforate, the larynx is poorly indicated, and the rudimentary laryngo-trachea bifurcates into right and left bronchi which are produced at their tips into dark brown, crumpled, noninflated lungs. The laryngo-trachea is com-

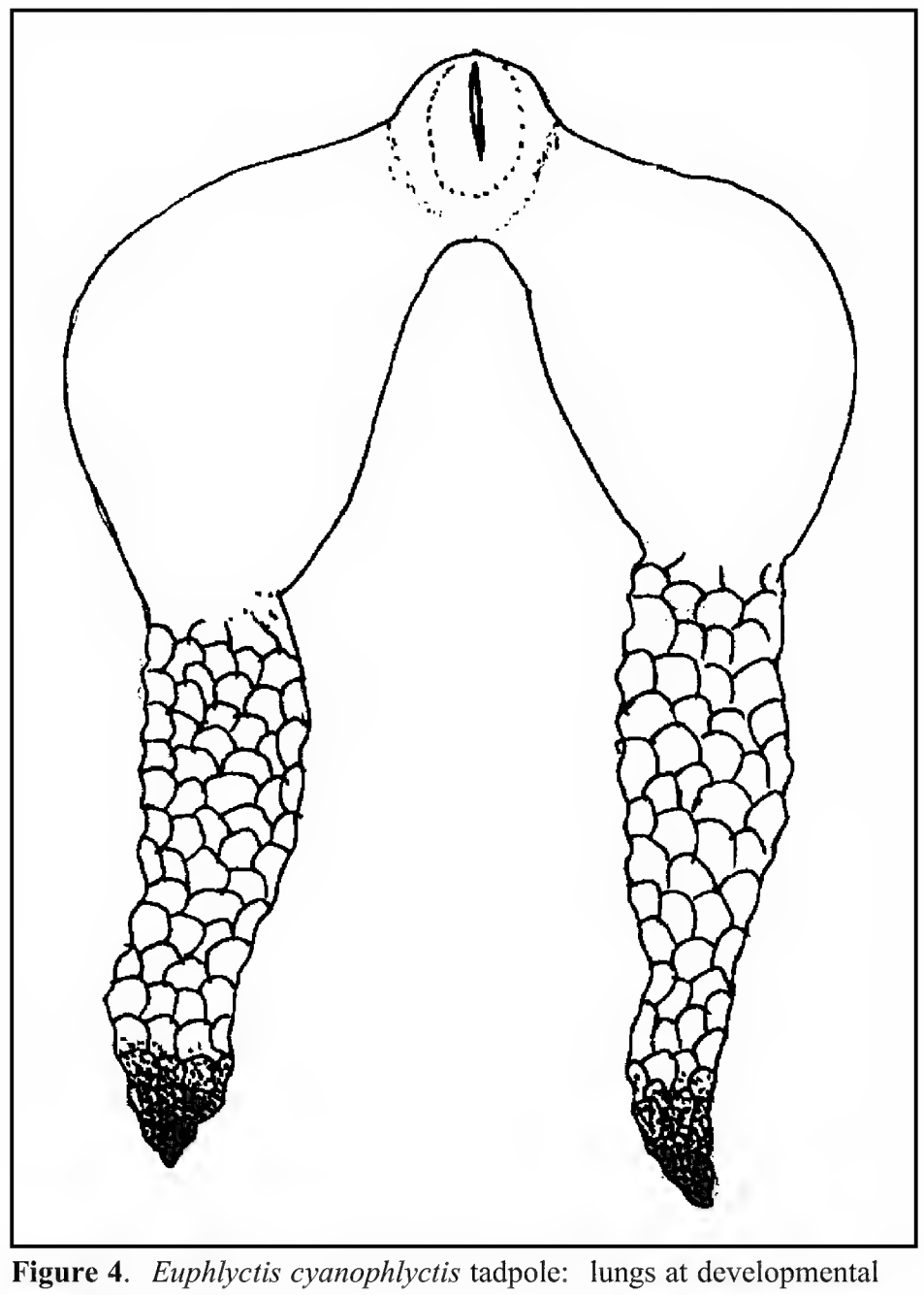

Figure 4. *Euphlyctis cyanophlyctis* tadpole: lungs at developmental Stage 35.

pletely blanketed by the ventral velum in the buccal cavity.

Microhyla ornata (Figure 2): In this species the pulmonary tract is fully configured and functional from the very start of the larval stage. The bulbous larynx is perforated by the glottis; the trachea is a long pipe that extends across a spacious pharynx and bifurcates into bronchi. The lungs are inflated ellipsoidal sacs, widest at the middle, and tapering posteriorly to pointed dark brown tips. The lungs extend all along the dorsum of the abdominal cavity, filling almost one-quarter to one-third of it. The larynx and trachea are prominent structures. In the buccal cavity the ventral velum does not cover the larynx.

Euphlyctis cyanophlyctis (Figure 4): The pulmonary respiratory system is well developed. The bulbous bronchial chambers with a distinct bulge in the middle fill the anterior half of the abdominal cavity, while the lungs extend laterodorsally on the intestinal part of the tadpole. The alveoli are quite large. The larynx is exposed.

Hoplobatrachus tigerinus (Figure 5): The larynx is prolonged anteriorly with the glottis. There is no trachea. The bronchi are short, while the lungs are elongated and are broadest anteriorly, gradually narrowing toward the posterior tips. The alveoli are exceptionally large in this species.

Limnonectes limnocharis/syhadrensis (Figure 6): The pulmonary respiratory system in these species is quite abbreviated. The laryngobronchial chamber is short, the glottis is perforate. The lungs are elongated fusiform, with large alveoli, and are tipped with black.

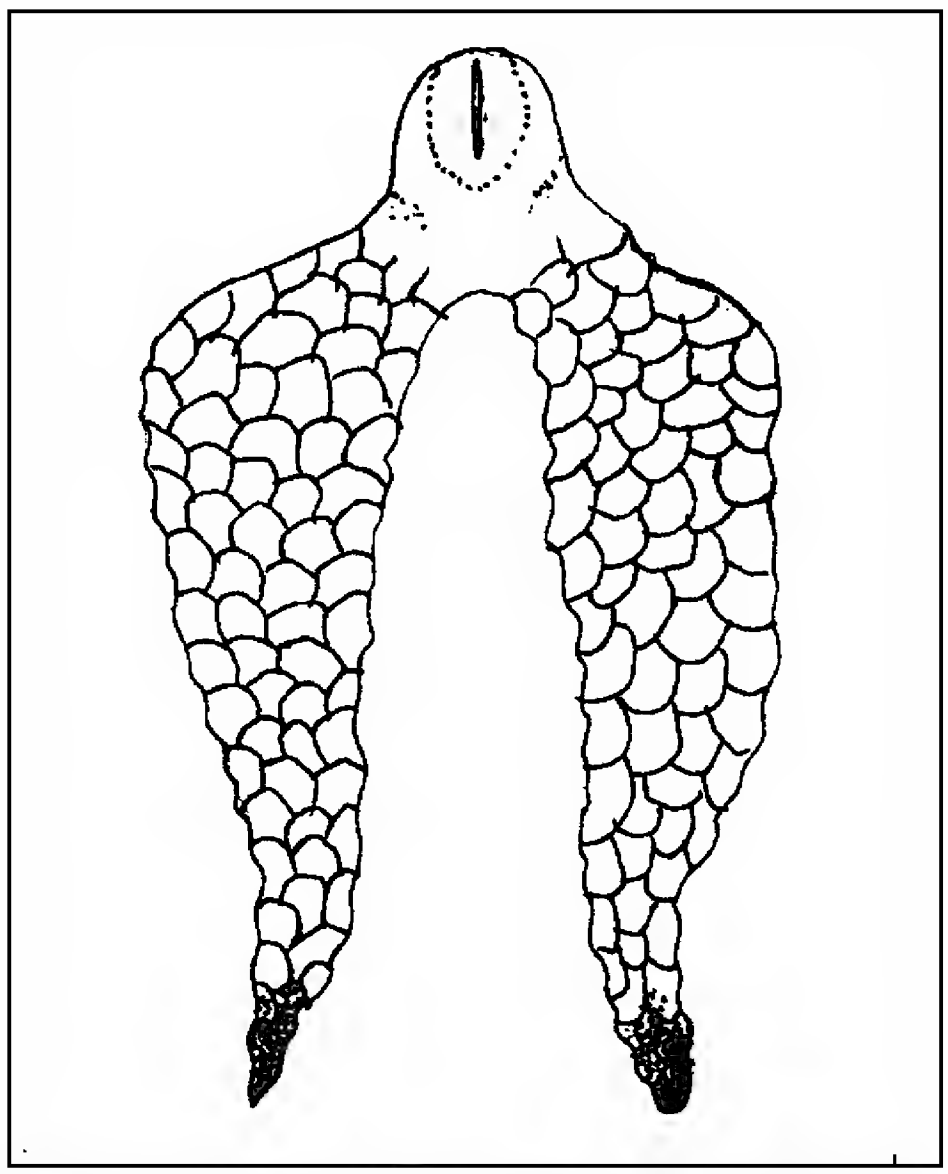

Figure 5. *Hoplobatrachus tigerinus* tadpole: lungs at developmental Stage 35.

Ecological correlates of lung morphology

In the tadpoles studied, the posterior quarter of the lung is dark brown, indicating the respiratory function of this portion. The rest of the lung is transparent with large alveoli, indicating the hydrostatic function of this part.

A tadpole is an independent, free living, nonbreeding vertebrate. Different species of tadpoles coexist in ponds and puddles, apparently without interfering with each other in acquisition of their vital needs. Each species occupies a niche and uses specific techniques to share the common resources available in pond habitat (Khan, 1991). Apart from respiration, the pulmonary system is put to other uses in different species of tadpoles: for instance, buoyancy, hydrostasis and locomotion. The microhylid tadpole relies on the lungs and laryngotrachea for buoyancy, while a jet of water from its median-ventral spiracle helps it to hover in the water column for long durations and to ascend and descend. In this tadpole though, gills are the main respiratory organ. However, floccular material filtered from the water may impair respiration by clogging the branchial basket. In such a case respiration may be supplemented by the lungs. Lungs in this species also function as hydrostatic organs (hyper developed bulbous laryngotrachea and large alveoli). Air held in these organs keeps the tadpole afloat and buoyant in midwater, and also acts as an oxygen reserve. The microhylid tadpole does not rest at the bottom; it swims constantly. The extra demand for oxygen for sustained swimming is met by the dual oxygen supply derived from gill irrigation and from the lungs (Khan, 2001).

Ranoids except *Bufo* have a well developed respiratory system from the very beginning of the larval stage. These tadpoles are large and natant, needing ample oxygen. The rudimentary respiratory organs of bufonids become functional at Stage 35, almost at the termination of metamorphosis. Prior to that these tadpoles typically stay in the oxygen-rich water at the margins, away from polluted depths of the pond (Khan and

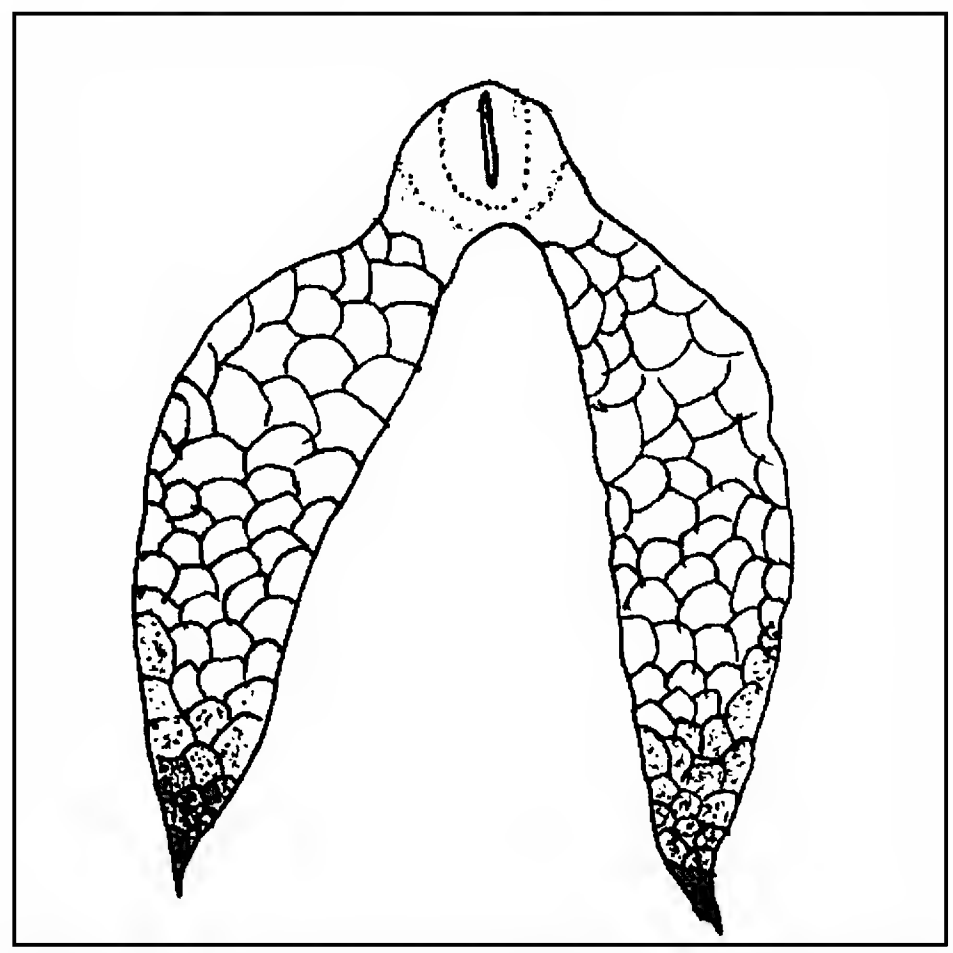

Figure 6. *Limnonectes limnocharis* tadpole: lungs at developmental Stage 35.

Mufti, 1994). The detritivorous, benthic *E. cyanophlyctis* tadpole prefers shallow water with much vegetation and detritus. It resides in ephemeral pools and puddles. Early development of the respiratory system in this species may be an adaptation to oxygen-deficient benthic environs. It may scurry to the margins to obtain air, or ascend periodically to the surface for this purpose. The ascending/descending movements are quick, since at this time the tadpole is most exposed to attacks by predators (Khan and Mufti, 1995).

The carnivorous *H. tigerinus* tadpole frequents ponds with shallow margins and much vegetation, a habitat which it usually shares with *Bufo*. Because of rudimentary gill plates, the gills are inefficient respiratory organs, so *tigerinus* relies mainly on pulmonary respiration. The abbreviated tracheal region and large lungs of this species ensure quick inhalation and exhalation as it sprints after its prey (Khan, 1996b). *L. limnocharis / syhadrensis* are usually denizens of shallow seepage pools. Being benthic they mostly loll at the bottom of oxygen-rich pools. These tadpoles are macrophagous grazers as well as microphagous filter feeders; their branchial baskets are always filled with floccular material clogging the gill-filter as in *M. ornata*. Hence these tadpoles rely mainly on pulmonary respiration (Khan, 1996a) rather than branchial respiration.

Rain is unpredictable in subtropical temperate Punjab. During rainier years, which are rare, substantial rain comes during spring (March–April), and amphibians avail of this opportunity to reproduce extensively before the onset of the intense summer. By the start of monsoons (July–August), most of amphibians are spent up. However, in less rainy years, little rain comes in spring. Ponds and puddles with tadpoles soon dry out if rain does not replenish the water bodies. Such unpredictable environmental conditions prevail in the plains of Punjab. All species of tadpoles either resort to carnivory to quicken the process of metamorphosis or die off in the drying ponds. The saline, relatively warm water of the drying ponds is rich in zooplankton, which form a protein-rich diet for metamorphosing microphagous as well as macrophagous tadpoles.

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Book Review: *Turtles of the World Vol. 2. North America* by Holger Vetter 2004. In English and German (at once). 127 pp., 501 color photographs, 43 maps in color. Edition Chimaira, Frankfurt am Main. Hardcover. ISBN 3-930612-57-7. $49.95

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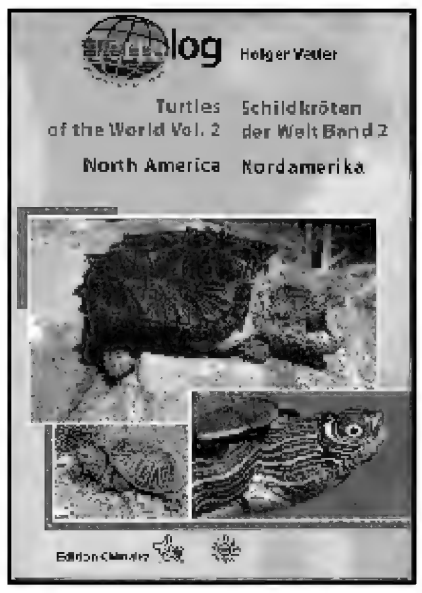

This attractive, encyclopedic book on the turtles of North America will be much appreciated by all turtle enthusiasts of the world as well as most herpetologists. This work generally embraces turtle husbandry, but it does so in a very scientific and systematic way which will please the professional herpetologist. The book is written in English and German at once, English appearing in the left-hand column of the book and German in the right-hand column. This book packs an enormous amount of information into 127 pages through the use of symbols (for instance: ⊠⊠ = no additional radiation heat required/*keine zusätzliche Strahlungswärme erforderlich*). These symbols are placed, in order, beneath each turtle image in the book and deal with the management of each species and subspecies of North American turtle.

The Contents section of the book (pp. 3–9) leads the reader to each taxon in the text by page number, but also manages to include the distribution of each species under each heading. The scientific and common names (common names in both English and German) appear to be as up to date as possible in this era of rapid taxonomic changes. The Introduction (pp. 10–14) explains the general taxonomic arrangement used in the book which mainly follows Iverson (1992) except for subsequent changes in the nomenclature or newly described forms. Then, there is a useful discussion of the status of each turtle family with attention to its taxonomic and other problems. Finally, there is a discussion of how to use this book relative to the various aspects of turtle husbandry. References to the literature cited in the introductory part of the book are given on p. 14.

The heart of the book comprises species (including subspecies) accounts of the turtles of North America (this continent is brightly depicted in color on the inside [facing] cover pages). Brightly colored maps included with the accounts show the range of each species and subspecies. Also, color images of habitats are provided in the taxonomic accounts. Some of these show specific regional habitats (for instance a muskeg surrounded by boreal forest in Nova Scotia for *Emydoidea blandingii*) and others more generalized habitats. Multiple images are provided for each subspecies of North American turtle in the book. Often different individuals are used to indicate common variations that occur. Almost always, a dorsal and a ventral view are provided as well as a head shot. Often images of mating individuals are included as well as shots of hatchling or juvenile turtles. The author states that pictures of turtles in the wild were preferred when selections of the book were made and that only in a few cases captive animals were shown. Some authors of photographs in the book that should be familiar to many people in the U.S. are: R. D. Bartlett, J. R. Buskirk, C. K. Dodd, L. L. Grismer, J. H. Harding, J. B. Iverson, J. Lovich, R. H. Mount, L. W. Porras, K. H. Switak and R. Wayne Van Devender. As in most turtle books the images are of varying quality, but all serve the purpose for which they were intended, the recog-nition of the species and subspecies of North American turtles, with some idea of the variability that occurs in each taxon. I would not be without this book and unhesitatingly recommend it to the readership of the *Bulletin of the Chicago Herpetological Society*.

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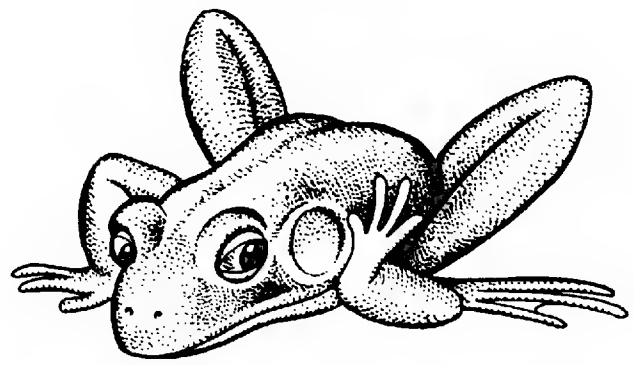
The Tympanum

Shawnee Snake Road Regulations



With about a week before the Forest Service closes the Shawnee Snake Road for the fall migration, I thought it'd be timely to update the herp community on the regulations that will be in force beginning September 1.

In the past the Forest Service has graciously "tolerated" the use of snake hooks and tongs on the closed road and vicinity with the understanding that they were to be used **only** to manipulate an animal in order to photograph or better observe it.

Unfortunately in the past year, the incidences of illegal collecting by unscrupulous individuals (some involving state and forest listed species) has increased, making it more difficult for Forest Service law enforcement and IDNR Conservation Police to distinguish between those illegally using hooks & tongs and those who are not.

Therefore, anyone walking the Snake Road or being anywhere within the LaRue-Pine Hills/Otter Pond Research Natural Area should not have any collecting apparatus on their person. This includes snake hooks, tongs, and of course, any bags or containers. Additionally, if you turn a rock, log, or talus to search, replace it as you found it. Too many times I have walked this road to see overturned items and the once moist microhabitat underneath is bone dry because someone irresponsibly didn't return the cover item to its original location.

To the local herp societies I have worked with (Chicago, Central Illinois, Champaign Area, and St. Louis), I want to thank you guys for your support of the Forest Service's stand to continue to close this road twice annually under much local opposition and for the responsible way you conduct yourselves in observing and not collecting when being in that area.

Just wanted to give everyone a heads-up on the regulations that will be more strictly enforced. Thanks for your understanding.
Scott Ballard, IDNR—Natural Heritage, 9053 Route 148, Suite B, Marion IL 62959. sballard@dnrmail.state.il.us

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Herpetology 2004

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

COPPERHEAD PREY PREFERENCES

E. Greenbaum and M. Jorgensen [2004, Amphibia–Reptilia 25(2):165-172] note that many crotaline snakes exhibit envenomated-prey preference in laboratory experiments. The authors examined the ability of copperheads (*Agkistrodon contortrix*) to distinguish between envenomated and nonenvenomated tobacco hornworm larvae (*Manduca sexta*). Snakes directed significantly more tongue flicks at envenomated hornworms than at nonenvenomated hornworms, and snakes consumed envenomated hornworms more frequently than nonenvenomated prey. These results support the hypothesis that envenomated tissue is an important stimulus to copperheads during strike-induced chemosensory searching. Copperheads preferred hornworms envenomated by conspecifics in the relative order: Louisiana > Texas > Kansas; this preference matches the relative order of preference and venom potency documented in a previous study of copperheads for envenomated mice. The authors conclude that the venom protein-prey tissue interaction responsible for the observed behavior is similar in both invertebrate and rodent prey items.

KOMODO DRAGON CONSERVATION

C. Ciofi and M. E. de Boer [2004, The Herpetological Journal 14(2):99-107] note that information on population size and distribution of the Komodo monitor (*Varanus komodoensis*) has so far been restricted to early reports or to surveys conducted on only part of the species' range. The authors carried out a study based on transects through sampling plots and single-catch trapping events to assess the extent to which the distribution of *V. komodoensis* has changed since the last comprehensive survey was conducted, in 1971. They also report on the status of the habitat and identify conservation priorities. Resident Komodo monitor populations are now found on only four islands in Komodo National Park and on the island of Flores in southeast Indonesia. Average population density estimates recorded on Flores were more than 60% lower than those reported for Komodo National Park. Habitat fragmentation and poaching of prey species currently represent the main threats to the Komodo monitor, and protection of monsoon forest in west and north Flores is crucial for the long-term conservation of the species.

PYTHON PREYS ON PORCUPINE

J. Jansen and P. Cunningham [2004, Herpetozoa 17(1/2): 86-87] report on a dead, 3-meter-long southern African rock python, *Python natalensis*, found on a farm in central Namibia. The python contained the carcass of an adult South African porcupine, *Hystrix africaeaustralis*. The quills of the porcupine were protruding through the skin of the python. The authors speculate based on the remains that the python was disturbed after ingesting the porcupine and tried to regurgitate its prey consequently resulting in the death of the snake.

LEAF-NOSED SNAKE TAXONOMY

S. A. Gardner and J. R. Mendelson III [2004, J. Herpetology 38(2):187–196] report that the previously recognized subspecies of *Phyllorhynchus decurtatus* artificially compartmentalize the inconsistent geographic variation in this species. Principal component analysis did not identify consistent geographic groupings of individuals. Regression analysis revealed a longitudinal cline in number of ventral scales, as well as some weaker clinal trends in other characters. There is extensive overlap in all morphological and color-pattern characters examined between four subspecies of *P. decurtatus* and their intergrades. There are differences between mean scale and blotch counts between previously recognized subspecies, but they do not represent discrete differences among these taxa. Discriminant analysis demonstrated the inconsistency in the observed geographic variation in this species. The authors conclude that *P. decurtatus* represents a geographically variable species lacking consistent geographic pattern classes.

TADPOLE TAIL COLOR AND PREDATION

J. Van Buskirk et al. [2004, Copeia 2004(3):599-602] note that some amphibian larvae develop brightly colored or black tail fins when reared in ponds with predaceous insects. The conspicuous tail has been proposed to lure predator strikes toward the tail and away from the more vulnerable head/body region. This hypothesis was tested by presenting model tadpoles that differed only in coloration to *Aeshna* dragonfly larvae. The models had either a dark body and pale tail, a dark spot in the middle of the tail, or a dark spot near the tip of the tail. Almost all models with plain tails were struck on the head/body, whereas those with dark spots in the tail were struck significantly more often on the tail. Because living tadpoles survive better when attacked on the tail than on the head, these results show that tail coloration can protect tadpoles from predators.

LEOPARD FROG CALL COMPLEXITY

K. A. Larson [2004, Copeia 2004(3):676-682] observes that the advertisement calls of male northern leopard frogs, *Rana pipiens*, may be the most complex of any temperate-zone anuran. To characterize this call complexity, the author analyzed acoustic properties and temporal patterning of male advertisement call notes. Calls included up to three note types (snores, grunts, and chuckles) and varied in complexity from one to 65 notes/call. Four common temporal patterns of notes in calls were observed, and transition probabilities of note pairs were nonrandom. Temperature influenced spectral and temporal properties of all note types; body size only influenced snore dominant frequency. Finally, the author compares *R. pipiens* calls to other anurans possessing complex advertisement calls. Although the function of specific call notes has been documented in these other species, the function of call notes in *R. pipiens* remains unclear.

PHYLOGENY OF *CERBERUS*

M. E. Alfaro et al. [2004, J. Biogeography 31:1277-1292] investigate how plate tectonic events over the last 10 Myr and changing sea levels during the Quaternary may have influenced the evolution of *Cerberus* Cuvier, a marine coastal snake belonging to the Homalopsinae (Oriental-Australian rear-fanged water snakes). The study analyzes mtDNA sequences of specimens from localities across the range of the widely distributed *Cerberus*: India, Sri Lanka, the Andaman islands, Myanmar, the Philippines, Borneo, Sulawesi, Sumatra, Vietnam, Thailand, Singapore and Australia. The sample consisted of 65 *Cerberus rynchops* (Schneider), three *Cerberus australis* (Gray) and four *Cerberus microlepis* Boulenger. One *Homalopsis buccata* (Linnaeus), one *Bitia hydroides* Gray, one *Enhydris enhydris* (Schneider), and two *Enhydris plumbea* (Boie) were used as outgroups. The resulting phylogenetic trees based on parsimony, maximum likelihood and Bayesian analysis do not support monophyly of the genus. *Cerberus australis* is highly divergent from all other *Cerberus* lineages sampled from this region. The geographically widespread *C. rynchops* is resolved into four biogeographical clades: Indian and Myanmar; Philippines; Greater Sunda Islands and Sulawesi; the Thai-Malay Peninsula and Gulf of Thailand. The authors discuss how the dispersal biology of a saltwater tolerant, coastal marine taxon and the complex geological history of the region could produce the observed patterns of diversification.

LEPTODACTYLID NICHES

M. A. Duré and A. I. Kehr [2004, Herpetologica 60(3): 295-303] analyzed trophic ecology and its relationship with environmental variables for two leptodactylid frog species, *Leptodactylus latinasus* and *L. bufonius*. The two species are common around Corrientes City, Argentina, where they live in the same habitat. The main objectives were to analyze the diets and patterns of coexistence relative to the microhabitat of each species. Weekly sampling was carried out January 1997–February 2000. A randomization test and canonical correspondence analysis were used for data analysis. In *L. latinasus*, the diet was dominated numerically by isopterans and coleopterans (25.25% and 21.21%, respectively) and volumetrically by insect larvae (37.14%). In *L. bufonius*, the alimentary contents were dominated numerically by isopterans (60.49%) and volumetrically by coleopterans (62.47%). The trophic niche breadth was wider in *L. latinasus* (6.55) than *L. bufonius* (2.44). The overlap in the trophic niche (prey proportion) was higher (O_{jk} = 0.81) and significantly greater than the expected mean value obtained bv chance (0.27). Spatial niche overlap between the two species was low (O_{jk} = 0.331) and not significantly different than the mean value expected by chance (0.52). Differences in microhabitat use were observed. While *L. latinasus* showed strong preference for mud, ground with crevices, and short grass and mud, *L. bufonius* showed preferences for dry land and short grass. In addition, the presence of this species was positively correlated with temperature and rainfall variables. Niche complementarity was observed between these species; although they exhibit high overlap in food, they tended to have low overlap in microhabitat use.

PLAINS GARTERSNAKE DEMOGRAPHICS

K. M. Stanford and R. B. King [2004, Copeia 2004(3): 465-478] conducted a six-year mark-recapture study of plains gartersnakes, *Thamnophis radix*, at a 2.65 ha study site on the campus of Northern Illinois University along the banks of the Kishwaukee River in DeKalb, Illinois. The results of this study, consisting of 567 captures of 216 individually marked snakes, and the birth of 889 young in 53 litters born to 39 wild-caught females, were used to estimate demographic and life-history parameters of this population. Males were found to differ from females in asymptotic size but not in the rate at which they approached this size. Size of known age individuals together with growth rate estimates were used to assign age at first capture. Age and sex were then used as grouping variables to obtain age- and sex-specific survival. The results suggest that males and females have approximately equal survival in the 0 and 1 age classes but that females have higher survival than males as adults (0.45 vs 0.35). Estimates calculated using Schumacher-Eschmeyer and Jolly-Seber methods indicate an adult population size of 64 and 172 adults, respectively, corresponding to densities of 40 and 107 adults per hectare. Average fertility increased from 6.4 in 1-year-old females to 21 among 6-year-old females. Detailed demographic studies such as this have utility in development of management strategies and theories concerning life-history evolution.

HOW TO TELL IF FEMALE FROGS ARE PREGNANT

H.-U. Reyer and I. Bättig [2004, Herpetologica 60(3):349-357] note that many techniques commonly used for monitoring amphibian populations and communities yield censuses of the total adult population size (N). However, for many studies, e.g., of reproductive output, development of populations and potential for evolutionary changes, the effective population size (N_e) must be known. While modern molecular techniques make it possible to measure N_e, they are expensive, work-intensive and may not be possible. For females of two species of water frog (*Rana lessonae* and *R. esculenta*), the authors investigate the effectiveness of several techniques to determine the presence or absence of eggs. The direct methods are (1) dissection and (2) a small skin incision into the abdominal side of live females. The indirect methods, all applied to live frogs, include (3) visual inspection of body shape, (4) tactile inspection of the epidermis, (5) transillumination with a strong cold light source, (6) ultrasound, (7) electromagnetic measurement of total body electrical conductivity (TOBEC), (8) calculation of body condition index and (9) analysis of blood plasma testosterone titers. Only two indirect methods were somewhat successful at predicting whether females were gravid. Testosterone titers (9) yielded the best results (ca. 80–90% effective). Body condition (8) was also significantly related to egg presence or absence, but predicted gravidity only weakly. The authors suggest that a combination of skin incision and hormone analysis provides a fairly good estimate of gravidity. When complemented by mark-recapture techniques and performed on the same individuals at different times of the season, this combination yields estimates not only of the reproductive output of the study population but also of the relative contribution of different females.

ROCK IGUANA NESTING ECOLOGY

J. B. Iverson et al. [2004, Herpetological Monographs 18:1-36] studied the nesting ecology of the Allen Cays rock iguana, *Cyclura cychlura inornata*, on Leaf Cay and Southwest Allen's Cay (= U Cay) in the northern Exuma Islands, Bahamas, during 2001 and 2002. Mating occurred in mid-May, and females migrated 30–173 m to potential nest sites in mid to late June. Females often abandoned initial attempts at digging nest burrows, and average time from initiation of the final burrow to completion of a covered nest was six days. At least some females completely buried themselves within the burrow during the final stages of burrow construction and oviposition. Females defended the burrow site during the entire time of construction, and most continued that defense for at least three to four weeks after nest completion. Nests were completed between mid-June and mid-July, but for unknown reasons timing was seven days earlier on U Cay than on Leaf Cay. Nest burrows averaged 149 cm in length and terminal nest chambers usually angled off the main burrow. Depth to the bottom of the egg chamber averaged 28 cm, and was inversely correlated with shadiness of the site, suggesting that females may select depths with preferred temperatures (mean, 31.4°C in this study). Overall, only about one in three females nested each year, although nesting frequency increased with female size such that the largest females usually nest annually. Nest fidelity was common, despite the potential for observer effects; seven of 13 two-year nesters placed nests within 0.7 m of that constructed the previous year.

Nesting females averaged 32 cm snout–vent length (SVL) and 1336 g body mass; larger, older females nested earlier than smaller, younger ones. Sexual maturity is reached at 26–27 cm SVL, about 750 g body mass, and 12 years of age (nearly twice as old as any previously studied lizard). Longevity of females apparently exceeds 40 years. Clutch size ranged from 1 to 10 eggs (mean 4.6) and was correlated with female body size and age. Eggs averaged 66 mm in length, 35 mm in width, and 49 g in mass. Egg mass was not correlated with female body size, although egg length was negatively correlated, and egg width was positively correlated with female size. The production of elongate eggs in the smaller females allowed them to invest the same total mass in each egg as a larger female, while being constrained by the limits of the pelvic opening. No trade-off existed between standardized clutch size versus egg size. Relative clutch mass (clutch mass/gravid female body mass × 100) averaged 16.5 and did not vary with female size or age. Hatching apparently occurs in late September and early October after about 80–85 days incubation, with emergence within just a few days. Hatchlings averaged 9.5 cm SVL and 33 g body mass. Survivorship to emergence was 78.9%, and was inversely correlated with soil moisture.

The reproductive ecology of other iguanids (*sensu strictu*) is reviewed for comparison with that of the Allen Cays rock iguana. Comparisons of these data with those available for other rock iguanas of the genus *Cyclura* suggest that colonization of smaller islands has produced reductions in adult female body size, clutch size, clutch mass, and relative clutch mass, but no change in egg or hatchling mass. Because this pattern is also demonstrated by a population of Cuban iguanas introduced to a small island only 40 years ago, it may primarily be a proximal response to decreased resource availability and/or physiological processability on small islands rather than an evolved response to reduced predation rates or other factors affecting survivorship.

PHYLOGENY OF ANOLES

S. Poe [2004, Herpetological Monographs 18:37-89] presents a phylogenetic analysis of the lizard genus *Anolis* using new morphological data in combination with diverse data from the literature. Ninety-one characters of osteology and external anatomy were completely or partially scored for 174 *Anolis* species and seven outgroups. These data were combined with data from chromosomes, DNA sequences, allozymes and immunology, and analyzed with parsimony to produce an estimate of *Anolis* relationships. The genus *Anolis* was supported as monophyletic. *Anolis occultus* is sister to the rest of the genus. A South American and Southern Lesser Antillean clade is sister to the Greater Antillean and Northern Lesser Antillean *Anolis* and a clade of mainland species. Successive clades of Caribbean Alpha *Anolis* are sister to the Beta *Anolis* (*Norops*) clade. Within the Betas, the Jamaican Betas are sister to the remaining Betas, and the Cuban Betas are sister to the monophyletic mainland forms. Other higher-level groupings of previous authors were not supported, but members of some previously-recognized lower-level groups formed clades: *roquet* series, "*Phenacosaurus*," *cybotes* series, *cristatellus* species group, *bimaculatus* series/species group, *hendersoni* species group, *chlorocyanus* series, *equestris* series, *grahami* series, *sagrei* series, *crassulus* species group, *gadovii* species group, *laeviventris* species group, *nebulosus* species group.

LIZARD BEHAVIOR TOWARD SNAKE SCENTS

L. Amo et al. [2004, Copeia 2004(3):691-696] note that many animals use chemical cues to detect predators. However, according to the threat sensitivity hypothesis, natural selection should favor individuals able to respond differentially to the chemical cues of predators that pose different levels of risk rather than responding to chemical cues of all predators in a similar way. The behavioral responses of prey to chemical cues of predators might depend, for example, on the degree to which predators include prey in their diets. The wall lizard (*Podarcis muralis*) is under high predation pressure by saurophagous-specialist smooth snakes (*Coronella austriaca*). Wall lizards are also an important part of the diet of the Montpellier snake (*Malpolon monspessulanus*) and occasional prey of the ladder snake (*Elaphe scalaris*). Also, wall lizards are sympatric with the non-saurophagous viperine snake (*Natrix maura*). In the laboratory, the authors compared the tongue-flick rates and behavioral patterns of wall lizards in response to exposure to chemical signals of these four snake species that pose different risks of predation. Results indicate that wall lizards were able to discriminate the chemical cues of the predatory snakes from the non-saurophagous snake. However, lizards did not respond differentially to chemical cues of different predatory snakes. Additional cues are probably needed to elicit an adequate, specific defensive response.

BLOOD-SQUIRTING BY HORNED LIZARDS

W. C. Sherbrooke and G. A. Middendorf III [2004, Copeia 2004(3):652-658] conducted six related studies with four captive juvenile kit foxes (*Vulpes macrotis*) to test the hypothesis that blood-squirting from eye-socket tissues by Texas horned lizards (*Phrynosoma cornutum*) is a canid antipredator defense. In 16 trials, naive "hungry" foxes killed and ate adult Yarrow's spiny lizards (*Sceloporus jarrovii*; eight of eight trials) slightly more frequently than adult *P. cornutum* (six of eight trials). Adverse responses by foxes (head shaking) were seen in five of six trials in which *Phrynosoma* squirted blood. Later these experienced foxes, fed ad libitum, killed and ate mice (eight of eight trials) while largely ignoring *P. cornutum* (one killed and eaten in eight trials), suggesting a learned aversion to horned lizards as prey. During attacks on mice smeared with horned-lizard blood, foxes displayed behaviors typical of predatory encounters with horned lizard prey (head shaking and prey tearing). These prey-handling behaviors were in striking contrast to those elicited by untreated mice and by mice treated with mouse blood, demonstrating that horned-lizard blood (and its chemical constituents) altered normal behaviors toward mouse prey. Prey-handling times for mice treated with horned lizard blood were significantly longer than mouse-only treatments. Responses of foxes to mice coated with horned lizard Harderian- and lacrimal-gland tissues coupled with responses to mice coated with systemic horned-lizard blood, mouse blood, and untreated mice suggest that (1) no defensive chemicals are added to the blood by orbital glands before blood ejection, and (2) active antipredator chemicals are carried in the circulating blood as well as in squirted blood. In four trials, foxes attacked "de-horned" horned lizards; a role for cranial horns in facilitating predator hesitancy prior to blood squirting is proposed. Evidence is presented that horned lizards visually identify and categorize foxes as appropriate predators for a blood-squirting defense. The authors conclude that, in many predator-prey encounters with wild canids, blood-squirting by Texas horned lizards is an effective chemical defense. They propose a scenario for the evolution of this unique defense and suggest that the defensive compounds found in the blood may be sequestered from the seed-harvester ant prey of horned lizards.

EASTERN NEWT SUBSPECIES

C. R. Gabor and C. C. Nice [2004, Herpetologica 60(3):373-386] note taht the eastern newt, *Notophthalmus viridescens*, is widely distributed in eastern North America and has been divided into four subspecies. These subspecies differ geographically in morphology and life history, suggesting that the subspecies represent locally adapted and differentiated entities between which gene flow is significantly reduced. The authors investigated the relationships among subspecies by assessing population genetic structure across the range of the species. They analyzed 18 allozyme loci to examine the evolutionary relationships among the four subspecies of eastern newts: *N. v. viridescens*, *N. v. dorsalis*, *N. v. louisianensis* and *N. v. piaropicola*. Despite moderate amounts of genetic variation, phylogenetic and phenetic analyses of the relationships among 12 sites resulted in trees that were inconsistent with the current subspecific classification. Cluster and phylogenetic analyses of allele frequency variation confirmed this, indicating an absence of significant differentiation among subspecies. Instead, populations of *N. viridescens* appear to cluster into groups representing geographic units that do not directly correspond to the currently recognized subspecies. The morphological and life history differences among the subspecies are not clearly associated with differentiation at allozyme loci. Recent divergence, gene flow, or phenotypic plasticity may explain the lack of correlation between genetic and morphological differentiation.

COMPETITION BETWEEN SALAMANDER SPECIES

J. L. Marshall et al. [2004, Copeia 2004(3):488-495] comment that aggressive interference can be an important expression of competitive interactions within and among species. The authors studied potential interference between two sympatric species of woodland salamander. The Pigeon Mountain salamander, *Plethodon petraeus*, occurs in habitat patches of rocky outcroppings along a restricted area on the eastern flank of Pigeon Mountain in northwestern Georgia. This species is relatively rare in the intervening areas of forest-floor habitat, which are occupied by a similar-sized, potential competitor, the slimy salamander, *Plethodon glutinosus*. Both species exhibited aggression and defended territories against conspecifics and heterospecifics in laboratory-based encounters. Individuals of *P. glutinosus* were superior in aggressive encounters with individuals of *P. petraeus*. Coexistence of the two species occurs because habitats are partially exclusive. There is enough habitat overlap, however, to generate possible interspecific competition. The authors hypothesize that the presence of territorial, aggressive *P. glutinosus* in areas between habitat patches may influence interpatch dispersal by *P. petraeus*.

ESTIMATING NEWT POPULATION SIZES

K. Weddeling et al. [2004, The Herpetological Journal 14(1): 1-7] note that drift fences are frequently used to sample amphibians for population studies. Thus, some researchers do not mark animals, but use capture rates at the drift fence as an indicator of population size. Other workers use mark–recapture techniques to estimate population sizes. These approaches require different amounts of effort and lead to different results. This study compares several estimates of population size for alpine newts (*Triturus alpestris*) and smooth newts (*Triturus vulgaris*) in five breeding ponds surrounded by permanent drift fences and pitfall traps. The estimates based on mark–recapture techniques (Petersen method) do not vary substantially between the two modes of recapture applied (funnel traps, and drift fences with pitfall traps). These estimates give even better results than simple counts if a substantial part of the newt populations remain within the drift fences throughout the year. While unrecognized trespass by newts appears to be a rare event, some newts may leave a pond for a short time even during the breeding season. This is an important source of bias for population estimates in studies based on counts at drift fences when animals are not marked.

Unofficial Minutes of the CHS Board Meeting, August 13, 2004

Lori King called the meeting to order at 7:40 P.M. Board members Michael Dloogatch, Brian Jones, Linda Malawy and Ed Rzewnicki were absent.

Officers' Reports

Recording Secretary: Melanie Aspan read the minutes of the July 16 board meeting. Corrections were made and the minutes were accepted.

Treasurer: Jim Hoffman presented the July balance sheet. There was extensive discussion relating to where to direct the Massasauga restricted funds but no definite conclusion was reached. Jim noted that, after expenses, he projects a $3,000 surplus for the Adoptions fund this year.

Corresponding Secretary: Steve Spitzer has accepted receipt of 14 turtles and tortoises, which have been willed to the CHS by Edward Wright. With this bequest also came a large collection of herp-related books, which will be offered to the CHS Librarian. Any of the books that do not gain a permanent place in the Library will be used as raffle items.

Committee Reports

Shows: Jenny Vollman announced future Notebaert weekends as: September 11 & 12, October 2 & 3, November 6 & 7, November 27 & 28, December 4 & 5, and December 26 & 27. August 28 was also mentioned as the date for a show in Washington Park.

ReptileFest: The first meeting for the coming year's 'Fest will be held on August 27 at 7 P.M. at the Humberts' home.

Library: Steve Sullivan mentioned that he is continuing to purchase additional books for the Library using the funds allocated earlier this year.

Adoptions: Bob Bavirsha showed the Board a new form generated by Linda that will now be filled out by all individuals giving up an animal for adoption. The form asks for pertinent information and presents the donation requirement.

General Meetings: Boas other than boa constrictors were chosen as the Herp of the Month for October's General Meeting and Skinks were chosen for November.

Nominating Committee: Ron Humbert will chair this year's committee and Zorina Banas, Jim Hoffman, Linda Malawy and Sean Bober have been asked to serve as members.

Grants: Byron de la Navarre has agreed to Chair this year's committee and Mike Dloogatch, Lori King, John Bailey and Matt Campbell have agreed to serve as members.

Conservation: Lori King informed the Board that some of the funds from Reptile Rampage at the Lake County Discovery Center have been sent to India to assist in the TSA's efforts to protect turtles from the meat trade in India.

Old Business

Zoo Trip: It was discussed that the group may stop for dinner in Galena on the way back from the Museum.

Arlington Chicagoland Family Pet Show 2005: Jenny Vollman reported to the Board that the total booth cost of $762.50 covers 2½ booth spaces at $285 per booth space, which is the nonprofit rate, as well as a $50.00 electricity charge. The Board discussed the options available as well as the perceived benefits of continuing to exhibit at this event. Matt Campbell moved to allocate up to $762.50 with the expectation that Jenny will inquire about the ½ booth space cost being negotiable. Melanie Aspan seconded the motion and it was passed unanimously.

Partial Funding of Crocodilian Relocation to Florida: Bob Bavirsha responded to the Board's inquiries regarding this year's transportation efforts. He reported that 70 animals will be making the trip this year and is estimating the cost of blood work will be $2,100. Bob also reported he hopes that the blood work may not be necessary this year due to the good condition of the animals transported last year. The state of Florida may be willing to waive the blood work requirements. Bob will not know whether or not this request will be filled until the state answers his letter. Jenny Vollman moved to allocate $2,100 from the Adoptions restricted fund for the blood work if needed. Jim Hoffman seconded and the motion was passed unanimously.

New Business

Reimbursement for Field Museum Show Parking: Jenny Vollman reported that this is being sent to us by the Museum.

AV Equipment: Lori King brought up the need for a CHS laptop computer to enable us to correctly run the PowerPoint presentations being brought to our General Meetings. The need for a projector for use in conjunction with the computer was also brought up. Lori asked that the more computer-savvy members of the Board look into our options. She also asked Steve Spitzer to draft a letter soliciting a donation or significant discount on an appropriate package for perusal at next month's meeting.

Michigan Fall Super Expo: Eric Tobin of the Michigan Society of Herpetologists has written to invite us to participate in their Fall Super Expo in Livonia, Michigan, on September 4. He has offered us free table space and a discounted room rate has been negotiated at a nearby hotel. Jenny Vollman and Steve Sullivan volunteered to represent the CHS at this event. The Board was in agreement that Jenny's and Steve's expenses should be covered and they should present their receipts after the trip.

Shawnee National Forest Concerns: The Illinois Wilderness Action Network is trying to gain federal protection for three additional adjoining areas. Lori King proposed that the CHS write a letter in support of this effort.

The meeting was adjourned at 10:11 P.M.

Respectfully submitted by Melanie Aspan, Recording Secretary

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, 6115 SW 137th Avenue, Archer FL 32618, (352) 495-9024, E-mail: GrmtRodent@aol.com.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. We feed our colony a nutrtionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. Mice starting from: pinks, $.17 each; fuzzies, $.24 each; hoppers, $.30 each; weanling, $.42; adult, $.48. Rats: starting with pinks at $.45 each, to XL at $1.80 each. Discount prices available. We accept Visa, MC, Discover or money orders. PO Box 85, Alpine TX 79831. Call **toll-free** at (800) 720-0076 or visit our website: < http://www.themousefactory.com> .

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice availabe: small newborn pinks up to jumbo adults. Prices start at $25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For Sale: two *Egernia cunninghami*, at least three years old, eating well (insects, fruit and veggies), $350. Can meet for delivery in the Chicago area. Please email ellen-petrick@excite.com.

For sale: Large sell-off of reptiles and amphibians. Call for list of what's available. Jim McDermott, (773) 445-9855, or (708) 952-0132, leave message.

For sale: 20" c.b. argus monitor, the prettiest of the monitor lizards, healthy, voracious feeder (crickets, pinkies), $225 or may consider best offer. Will deliver in Chicago area. Bill, (708) 799-6697.

For sale: c.b. '03 yellow anacondas, aggressive feeders, perfect health, about 2 ' long, $100 each; also c.b. '04 reticulated pythons; beautiful hatchlings already feeding on adult mice. These guys are tiger siblings and are available for $100/each as well. Personal checks, money orders and Paypal accepted. Out of state shipping available. If you have questions or would like to purchase an animal call Mark Petros, (847) 836-9426 or E-mail ballpython777@yahoo.com.

Herp Tours: Why pay more? Travel with the International Fauna Society, a 501 (c)3 not-for-profit organization, and experience the Costa Rican rainforest! Stay at the beautiful Esquinas Rainforest Lodge in the untouched herpetological paradise that is Piedras Blancas National Park. Meet new friends, relax in the naturally-filtered swimming pool or in the lush, fauna-filled tropical garden. Discounts for IFS and Chicago Herp Society members. For details, visit The International Fauna Society website at www.faunasociety.org or E-mail: info@faunasociety.org.

Herp tours: Adventure trips to **Madagascar**! Journey somewhere truly unique to seek and photograph nature on the world's least-studied mini-continent. For maximum herp fun and discovery, join Bill Love as we go where few people will ever venture in their lives. Let his experience assure a comfortable tour finding the most colorful and bizarre species on the planet! Get all the details at Blue Chameleon Ventures' comprehensive new website: < http://www.bluechameleon.org> , E-mail: bill@bluechameleon.org, or call (239) 728-2390.

Herp tours: Experience the Amazon! Road-ride in Costa Rica! See and photograph herps where they live, have fun doing it, make good friends and contacts, and best of all . . . **relax!** From wildlife tours to adventure travel, **GreenTracks, Inc.** offers the best trips led by internationally acclaimed herpers and naturalists. See our website < http://www.greentracks.com> or call (800) 9-MONKEY. E-mail: greentracks@frontier.net.

Pet Sitting: In-home care for all your pets' needs. Specializing in reptiles, amphibians, birds, fish, dogs, cats. . . . Very passionate in herpetology, experienced vet technician at an exotic animal hospital, aquarium technician for over 10 years. Great references available. Call Lisa Collins to book your special care requests, (847) 644-3681. [Northshore based]

Wanted: **Shed skins**. I am studying the sheds of eastern North American snakes for the purpose of developing an identification key. If you keep any of the following species, would you consider providing me with sheds? I need sheds from: *Agkistrodon contortrix mokasen*, *Carphophis amoenus* ssp., *Cemophora coccinea*, *Clonophis kirtlandii*, *Coluber constrictor* ssp., *Elaphe gloydi*, *E. guttata*, *Farancia abacura* ssp., *F. erytrogramma* ssp., *Heterodon platirhinos*, *Lampropeltis calligaster*, *L. g. getula*, *L. g. niger*, *Nerodia erythrogaster* ssp., *N. taxispilota*, *Opheodrys aestivus*, *Pituophis melanoleucus* ssp., *Regina ridida* ssp., *Sistrurus catenatus* ssp., *Tantilla coronata*, *Thamnophis butleri*, *T. radix*, *T. sauritus* ssp., *Virginia striatula* and *V. valeriae* ssp. For more information on how you can help with this project, please contact me at the following address: Brian S. Gray, Serpent's Cast Identification Services, 1217 Clifton Drive, Erie PA 16505-5215, or call (814) 833-1074.

Wanted: Female ball pythons, adults preferred but smaller animals also considered. I am a professional breeder specializing in ball pythons and I can assure you that your animal will be provided with excellent care and optimal living conditions. Mark Petros, (847) 836-9426; ballpython777@yahoo.com.

Line ads in this publication are run free for CHS members — $2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: MADadder0@aol.com.

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, September 29, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. Renowned author and nature photographer **Karl Switak** will lecture and show slides featuring the herpetological wonders of South Africa's Kalahari Desert. This program will include scenes from Karl's latest trip to the Kalahari, last October, on which he was accompanied by Lori King and Mike Dloogatch.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum — the **Peggy Notebaert Nature Museum**. This beautiful new building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, try to be present the October board meeting. Because of possible conflicts the date and place of this meeting are still undecided as of this writing. If you think you might like to attend, please call Steve Spitzer, (773) 262-1847, to get the details.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info call Lisa Koester, (773) 508-0034, or visit the CTC website: http://www.geocities.com/~chicagoturtle.

HERP OF THE MONTH

Each monthly meeting will showcase a different herp. CHS members are urged to bring one specimen of the "Herp of the Month" to be judged against the entries from other CHS members. Prizes will be awarded to the top three winners as follows: 1st place—6 raffle tickets at next meeting; 2nd place—4 raffle tickets at next meeting; 3rd place—2 raffle tickets at next meeting. The categories for the coming three months are: September—ratsnakes; October—boas other than boa constrictors; November—skinks.

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